Electrical World

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Looking Ahead for an Industry

AN EDITORIAL

TO-DAY a city rises where ten years ago, on the shores of Lake Michigan, spread only sand dunes. In the heart of New York, apparently separated from a great railroad system by insuperable obstacles, stands now a great railway portal. These examples—Gary and the Pennsylvania Railroad Terminal—taken from two great industries, typify American industrial progress. Gary was needed, and a man with imagination, courage and resourcefulness made a dream a reality. A railroad required a metropolitan terminal, and the bronze figure of Cassatt now looks down on the vaulted marble station which was once simply his idea—a plan.

Our own industry has not lacked either the necessities or the men with high foreheads and resolute chins. Economic principles demanded the centralization of the production of electrical energy. And in a great prairie State to-day, to mention only one, is a spreading network of energy-carrying transmission lines. Necessity demanded the standardization of telephonic communication. Individual achievement has given our country a telephone system that in extent and service cannot be matched in the world.

The industry to-day faces other problems. The electrical business in one sense has advanced backward. Other enterprises, which measure their age in multiples of half centuries, are just now groping in the dark to find principles to guide them through practice. Our industry, not yet fifty years old, was founded in science. Other industries now seek fundamentals to guide future practice. Ours is based on fundamentals. Tradition says that the inch was determined as the first joint of a king's thumb. Electrical units of measurement—the volt, ampere, coulomb, ohm—are the familiar names of the mathematicians and physicists whose early researches made the electrical science possible.

FOUNDED in science, the electrical industry has leaped centuries of rule-of-thumb. Standards have been fixed, not by comparative practices, but by formulas. The "wastelessness," or efficiency, of electrical mechanisms because of this exactness of measurement and control is not approached in any other industry.

The men of the industry and the thought of the industry broadly have been focused on the engineering problems of development to meet the more obvious needs and conditions under which electricity has been applied. This first great step of primary application and adaptation has been taken. The industry as a whole must now take the second step. Having "solved ninety per cent of the problems of engineering development," it must marshal the great forces within it on the problems of widening the application of what now exists. In this is the great problem of the moment—to capitalize the advantages of electricity for the mutual benefit of the industry and the public.

Problems of engineering are still important. Many opportunities for the wider application of electricity in the sister arts and industries await the solution of certain detail engineering problems. But broadly the advance of the industry is not dependent now upon fundamental theoretical advance or unusual increases in technical efficiency of equipment and apparatus. The problem is one of marketing, of applying to the distribution of products the same quality of mind, the same research, that will lead to a mechanism of distribution as efficient in its way as the mechanisms of production. This is not the task of any one group of men in the industry, but of all groups.

THIS is not the place for a statement of the details of the problem. Details might confuse the issue. Commerce must not be mistaken for commercialism. The main facts are clear: First, that the industry, built with scientific thoroughness, must meet its present problems in the same spirit of thoroughness that has threaded past achievement; second, that the broad problems of merchandising and public relations are susceptible of the same searching analysis for facts as the problems of design and development; third, that one industry may learn from the successes and failures of another, and, fourth, that it is work for the big men, for the men of imagination.

This number of the ELECTRICAL WORLD marks a cooperative movement which in its conception is unique and far-reaching. Practical realization calls for the best in the industry. Plans are many and complex. But they can be worked out if the men of vision within the industry keep clear the fundamental conception of the movement. Prosperity Week is but one factor in a possible movement to advance the industry as a whole. Who will deny the possibility of future achievement in an industry which has both ideas and the men to put them into practice?

Drifting with the Tide

Do managers of central stations clearly realize the size of the exports of gasoline automobile trucks to Europe at the present time? Do they consider what the stoppage of those exports at the conclusion of the war will mean to the electric-vehicle industry? In nine months the value of automobile trucks exported through the port of New York alone was approximately $39,000,000. Production has increased almost forty-fold within the year. These are striking totals. Their menace to the electrical industry lies in the attempt which surely will be made by the gasoline-truck manufacturers to keep up their tremendous outputs. Competition will be keen and destructive. Unless the builders of electric vehicles, central stations and manufacturers of accessories push the sale of electric trucks with might and main, and that promptly, the day for the "electric" will be lost. It will go down before the onslaughts of the gasoline truck. Of course, the result will only be a setback. The electric truck has distinct advantages. But postponement will be a needless sacrifice to lethargy. The lighting industry has much to gain in the extended use of the electric vehicle. It cannot do all the work of introduction, but it can help immensely. Action, concerted, vigorous and strong, is needed, and the time for action is now.

Losses and Gains with Steel-Core Aluminum Cables

Aluminum is usually cheaper than copper of the same length and resistance, but an aluminum transmission line is often more expensive than one of copper owing to the lower tensile strength of the former metal, which makes it necessary either to erect the spans with a greater sag or to reduce the length of spans. The consequent increase in the height or number of poles is often sufficient to counterbalance the advantage of cheaper metal. An attempt has been made to remedy this condition by combining in a single cable strands of aluminum and steel wires. Where aluminum is cheap and long spans are permissible, this steel-reinforced cable presents undoubted economic advantages.

The aluminum strands are designed to carry the entire current and the steel strands to carry the entire mechanical stress at high temperatures, the aluminum taking up an increasing share of the stress as the temperature falls.

The cable is made by stranding aluminum wires around a steel core, which may be either a single wire or a group of wires, depending on the size. As the greater part of the current is carried by the aluminum wires, it circulates around the iron core as in the windings of a choke coil. This adds to the reactance of the line and gives rise to hysteresis losses. The former is compensated for by the conductance of the steel itself. Data on the latter are not available.

The steel-core aluminum cable will, therefore, be more economical than plain aluminum if the capital charges on the extra cost of the steel core and the value of the extra line losses due to hysteresis and reduced power-factor are less than the capital charges on the extra cost of poles to accommodate a plain aluminum line.

The steel core is usually double-galvanized to prevent corrosion. Cables with ungalvanized cores have, however, been under observation for about seven years and show very little deterioration. This is probably due to the fact that the aluminum wires, being comparatively soft, bed so tightly about the core when the cable is in tension that very little water can enter.

One of the faults of aluminum for transmission lines is the liability of wires being burned off by accidental arcs due to foreign wires falling across them. This danger is reduced by the use of steel-core cables, as momentary arcs which might impair the strength of the aluminum wires will not reach the steel core, which furnishes the principal strength of the cable.

The steel core used in these cables has an elongation from 3 to 4 per cent against 1.5 per cent for aluminum and slightly over 1 per cent for hard-drawn copper. The cable is, therefore, able to stretch considerably more before breaking and is more reliable for long spans than either of these metals. One of the interesting consequences of the association of metals of different coefficients of expansion is the fact that the maximum sags to be provided for are due to external loads and not to the maximum temperature.

The article in this issue by E. T. Driver and E. V. Pannell presents for the first time most of the essential data on this interesting type of cable and shows how the resultant properties of the cable may be deduced from the properties of its constituent metals. It is to be hoped that full information will in time be available regarding the reactance and iron losses at standard frequencies.

Electricity for Industrial Heating

Relatively little has been done in adapting electricity to industrial processes involving heat. There are electrically heated glue pots and solder pots, soldering irons and similar articles in very successful use, but the load thus to be obtained is small. It is in the bigger industrial work that hope of large and profitable load lies. There is much electrical furnace work possible upon which efforts have scarcely been begun. The vulcanizing oven forms perhaps the only common example, but beyond this there are many heating and annealing furnaces in a large group of metal manufactures to which electricity might be applied with the greatest possible advantage. Electric current is the most completely reliable and easily regulated source of heat. If it comes to a question of holding any substance for any purpose at a uniform temperature, high or low, with entire absence of gaseous by-products, and if necessary without the access of air, electrical heating has vast advantages over anything else. It has as yet been applied only to a very slight degree in such critical heating processes as those involved in fine tempering work, where the exact reproduction of temperatures implies exact uniformity of product.

At the still higher temperatures required for the making of difficult alloys the electric furnace can be made entirely dependable in turning out uniform product, especially where the melting must be done in the presence of an inert gas. In the uniform drying of materials and in all sorts of annealing processes the temperature can be held at the most advantageous point or reduced automatically at any required gradient. The exploitation of this particular field demands something more than the ordinary abilities of the salesman. It requires rather broad knowledge of industrial processes in which heat is required and considerable skill in the adaptation of electric heating to meet the exact requirements of each case. The manufacturers of heating apparatus would do well to follow up this line of operations more actively than at present, because while it deals with special applications they are such as justify, from the perfection of their results, considerable expenditures, quite enough to recoup the manufacturer for his specialization.

From the standpoint of the central-station man apparatus of this kind, which yields a considerable and rather steady load, sometimes continued over the twenty-four hours, is a very valuable future asset. He can depend upon it in any active industrial community for a considerable addition to his load if he can make prices to meet the requirements of the situation. These must necessarily be moderate prices, running down at least as low as the motor scale and perhaps adjusted to run even lower under favorable conditions. For as a heat producer electric current has to compete, in the case of furnaces and other such uses, with a fairly direct and efficient application of fuel of one sort or another—applications considerably more efficient than are met with, for example, in electrical cooking, where the competition is only with the cook stove, probably the most inefficient form of heating device. At central-station prices which still yield a profit, however, a very large amount of such work can be taken on and yield a profit, particularly since it has on the whole no peak.

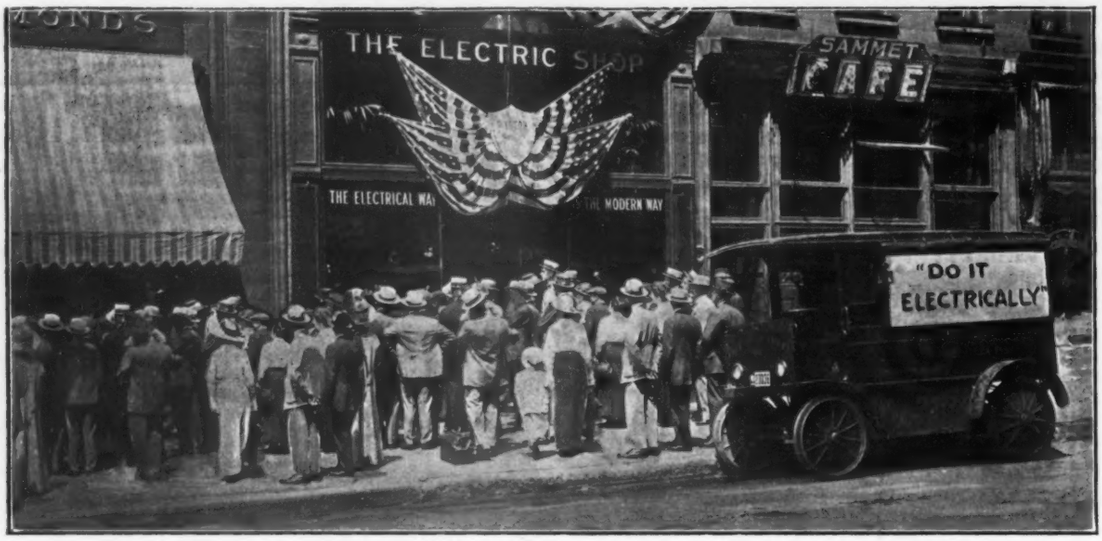
Recording Meters for the Fireman

Much has been said and written concerning the low evaporative results obtained in many steam plants, and the blame for these poor performances is often laid at the door of the fireman. It is undeniable that this is the correct diagnosis in many cases; but it must be admitted, in justice to the fireman, that his is the most uninviting and distasteful work in the power plant, because of the dust and the grime, the necessity for cleaning the boilers inside and outside, the physical exertion of firing, and the extremes of heat and cold to which he is subjected. But even if such things as these are disregarded, there remains the drawback that the average fireman has no simple and direct way of knowing the degree of efficiency he is attaining. He is working in the dark, so to speak. He shovels coal and he produces steam, and the faster he fires the more rapidly is steam generated. But as to just how many pounds of water he is evaporating per pound of coal he is sublimely ignorant. The reason is that he has always been trained to swing the scoop keeping one eye on the pressure gage and the other on the gage glass. With no other instruments to divide his attention, it is but natural that he should come to the conclusion that the maintenance of the desired pressure is the chief object and that all else may be neglected. If at any time he feels doubtful as to how thoroughly the fuel is being burned, he has no certain way of knowing.

However, the boiler room is gradually coming into its own. The introduction of the continuous flue-gas analyzer and recorder is a step toward the attainment of better management of furnaces. But after the heat is economically generated in the furnace it must be applied to the evaporation of water, and this step in the energy transformation likewise needs an indicating device, which has been met by the development of the steam-flow meter and the metering feed-water heater. The former indicates by a visible record the amount of steam leaving the boiler in a given time, and the latter shows the amount of feed water being delivered to the boiler. Still another device, the coal meter, gives an indication of the amount of fuel fed to the furnaces in a known time. With such devices as these, the element of uncertainty in boiler operation can be largely eliminated. If a fireman knows the rate of combustion of fuel and the rate of evaporation of water, a simple calculation will show him the amount of steam generated per pound of coal; and if, in addition, he has a check on the efficiency of the combustion by means of the CO_2 recorder, he is in position to work intelligently toward a realization of the best possible performance.

Engineers and Schoolhouse Lighting

That schoolhouses are badly lighted has come to be notorious. In an institution where light is so necessary a factor it is often completely overlooked, both in building design for natural lighting and in provision for artificial illumination. Windows are narrow and seats are often wrongly placed facing them. Blackboards absorb light on two sides of the room. On winter afternoons flickering fishtail gas burners make books seem even more melancholy. And, to cap the climax, the local women's club puts geraniums and white curtains in all the windows to make the rooms homelike—and dark. A committee for the Society of Illuminating Engineers has prepared an illustrated lecture on this subject which deserves wide recognition. A better opportunity to show what might be possible can hardly be imagined. There is little need to enlarge on the factors. They seem evident. Schoolhouses are being adapted more and more as centers for various civic activities outside of regular school hours. Aside from the need for being well lighted for the limited number of dark winter afternoons, an increasing number of schoolhouses present potential possibilities as a market for the services of illuminating engineers, fixture manufacturers and central stations.



A Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

ELECTRICAL PROSPERITY WEEK CAMPAIGN

Excellent Progress Made by Various Committees in All Sections of the Country—Movement Gains Impetus

NOT only have the influential organizations in the industry, numerous non-electrical associations, chambers of commerce, boards of trade, societies and individuals, pledged their heartiest co-operation and support for Electrical Prosperity Week, Nov. 29-Dec. 4, but many of them are now at work making plans for fitting celebrations. The director of the bureau of recreation of the city of New York, for instance, has in contemplation an electrical pageant to be given in one of the great parks of the city during the week. Many of the national advertisers have planned to run big displays previous to and during the week, and in addition others who do not make electrical devices plan to take advantage of the movement by embodying in advertisements where possible an electrical device.

The Society of Electrical Development has just brought out the first issue of *The Exciter*, a four-page bulletin of progress, got up in newspaper style, to enable all those connected with the industry to keep in touch with the various phases of the Prosperity Week movement. Some idea of how the industry is awakening to the great educational and sales opportunity of Electrical Prosperity Week is given in the issue, as well as suggestions whereby the various branches of the industry may be better prepared to secure their share of the business.

Louisville, Ky., had the honor of signing the first Electrical Prosperity Week proclamation. The proclamation was passed at the regular meeting of the Jovian League, at which meeting also a number of the most progressive Jovians in the city were appointed on a committee to carry out the plans outlined. It is the intention of the Jovian League to make the event one to be remembered in Louisville.

Reports received from all sections of the country are most encouraging and indicate the enthusiasm with which the movement is indorsed.

Joseph F. Becker, chairman of the Commercial Section of the National Electric Light Association and sales manager of the United Electric Light & Power Company of New York City, says: "Upper Manhattan will be thoroughly awakened to the wonderful possibilities of electric service as never before. This is a remarkable national trade-building campaign, and we purpose to take the fullest advantage of it."

W. S. Hanbridge, secretary of the California Electrical Contractors' Association, speaking of the organization of the local committee in San Francisco, says of Electrical Prosperity Week: "The only thing bigger here is the Exposition, and the 'Week' closes that. Have had the biggest fire in America, got the biggest Exposition in America, and going to have the biggest 'Week' in America. San Francisco does things that way."

"Syracuse, N. Y., will have a veritable 'Hall of Electricity' during the 'Week,'" writes Mr. O. Dell Plain. "Contractors, jobbers, retail dealers and central-station operators will co-operate in equipping a complete electrical establishment wherein every known appliance that depends upon electricity for its power will be exhibited and in many cases demonstrated. It is the plan of the committee to hire some hall or large store centrally located and 'let Jove do the rest.' Appliances for the culinary department, for the sleeping-rooms, nursery, lavatory, library, den, dining-room—in fact, for every room from cellar to attic in the modern home—will be connected and demonstrated."

John F. Gilchrist, vice-president of the Commonwealth Edison Company of Chicago, told a representative of the ELECTRICAL WORLD that he is thoroughly in accord with the idea of celebrating "Electrical Prosperity Week." "We believe in taking up every good movement to advance electrical markets and doing what we can to make it a success," he said.

"In order to have the celebration representative and significant, I believe that it will be desirable to make arrangements in advance, yet I feel that it will have more 'get up and go' if it is planned at a late day and then pushed with great enthusiasm. Co-operation of

the different branches of the industry in each locality will do a great deal to promote the celebration. I do not see how the various central-station companies could co-operate with advantage, as their direct interests do not extend beyond their own districts. Manufacturers, however, can work together for substantial results. One feature of the celebration which the public will expect is attractive illumination. This and other features will present the spirit of Electrical Prosperity Week satisfactorily and with undoubted benefit to the different branches of the industry."

H. N. McConnell, commercial manager United Gas & Electric Engineering Corporation, says: "I feel this celebration offers the best business-getting opportunity that has ever been brought before the electrical industry. We are behind this movement from start to finish, for we recognize the wonderful opportunity presented to us and we are certainly going to make use of it."

W. W. Freeman, past-president of the National Electric Light Association and president of the Union Gas & Electric Company of Cincinnati, writes to the ELECTRICAL WORLD: "Personally I am most heartily in sympathy with the movement and believe that through hearty co-operative effort it will prove entirely successful."

The Public Service Electric Company of New Jersey will conduct special displays of all kinds of electrical goods and make special displays of lighting during the week. The company is endeavoring to have the electrical dealers and contractors in its territory do likewise. Measures have also been taken to have the business men's associations co-operate in the general plan for celebrating Electrical Prosperity Week.

The Toledo Railways & Light Company plans an electrical show in a prominent down-town location. A feature of this show will be a model electrical home, and the company has the assurance of merchants and manufacturers that they will co-operate to make the show something worth while. The event will be advertised in the cars of the city, on the outside of the cars, on billboards, and in the press. The company looks to see the wave of optimism started by the electrical interests sweep with it many chronic pessimists.

"OUR BUSINESS"

Humanity may be divided, like Gaul, into three parts—users of service, inventors of methods and means of service, and those who undertake to bring what the second class has to the knowledge of what the first class wants. A common name for this third class of activities is Business.

We, of the electrical industry, are fortunate to be engaged in a business whose growth means even greater comfort and prosperity to our fellow-men—the users of our particular service. Examples are many. In these days of higher prices it should be gratifying to know that we now give our customers at least five times as much light for a dollar as we did twenty years ago. The marvelous achievements already to the credit of electricity warrant us in rededicating our efforts to still greater results.

In a few decades the science of electricity has been remarkably developed, while its application to the uses of man has grown at lesser pace. The splendid work of our great electrical inventors would go for little if their work was not supplemented by an army of men to give the widest and most useful application to means and methods the inventors have thought out.

We all have our place in this three-sided partnership between users, inventors and distributers. We cannot all be inventors. We can all do our part to carry the benefits of electricity to our fellow-men.

The Society for Electrical Development is the only society or association that includes in its conception all those classes of people served by the development of electricity. The society is a clearing house for ideas. It does not attempt to supplant the work of others, but encourages further effort by everybody.

I sincerely believe that for every dollar expended on a national campaign for electrical development the electrical industry as a whole will profit at least ten dollars. And what we invent and make and sell for ten cents is often worth to the user ten dollars.

Henry L. Doherty

President Society for Electrical Development, Inc.

Huge Exports of Automobile Trucks

Since last October the value of gasoline automobile trucks exported to Europe has jumped by leaps and bounds. Few in the electrical industry realize the enormity of the export business resulting from the war, and electric-vehicle manufacturers view with not a little apprehension the increasing activities of gasoline-truck manufacturers. What the effect of this greatly augmented production will be on the home market after the war is hard to foretell, although very keen competition between gasoline and electric truck manufacturers for whatever business presents itself is predicted.

About 55 per cent of manufactures exported from the United States goes from the port of New York, and the foreign-trade department of the National City Bank shows in its record the extent of the export trade leaving New York. The value of automobile trucks, excluding passenger cars, exported during the nine months beginning with last October, compared with the previous year, is given in the table herewith. The great majority of these trucks went to France and England.

No records are available as to the value of trucks exported through other ports, but at the present rate the port of New York alone will show about $60,000,000 for the year. If that represents only 55 per cent of the total exported, the gasoline-truck manufacturers have managed to sell over $125,000,000 worth of goods to the European nations thus far. However, it is more than probable that most of the business cleared from the port of New York, and that the export business in gasoline trucks for the year is nearer $75,000,000 than $125.000,000.

COMMERCIAL VEHICLES EXPORTED FROM PORT OF NEW YORK

Month	1913-14	1914-15
October	$129,506	$2,286,964
November	105,501	2,244,518
December	100,660	3,387,729
January	74,491	2,545,527
February	83,461	3,022,482
March	63,932	4,725,563
April	72,676	5,240,481
May	127,024	6,583,912
June	120,257	8,578,802
Total	$877,508	$38,615,978

Youngstown's New Street-Lighting System

The new street-lighting system of Youngstown, Ohio, which was inaugurated on Aug. 18, is notable because it is one of the most extensive exclusively gas-filled tungsten-lamp street-lighting systems in the United States and because of the short period required for installing a large number of ornamental standards which required the laying of nearly five miles of underground circuits along down-town streets. In addition to the ornamental standards there are 185 miles of streets lighted by lamps supported by brackets extending from wood poles. The work of constructing the new lighting system was begun on March 3, 1915. Thus less than five months saw it completed.

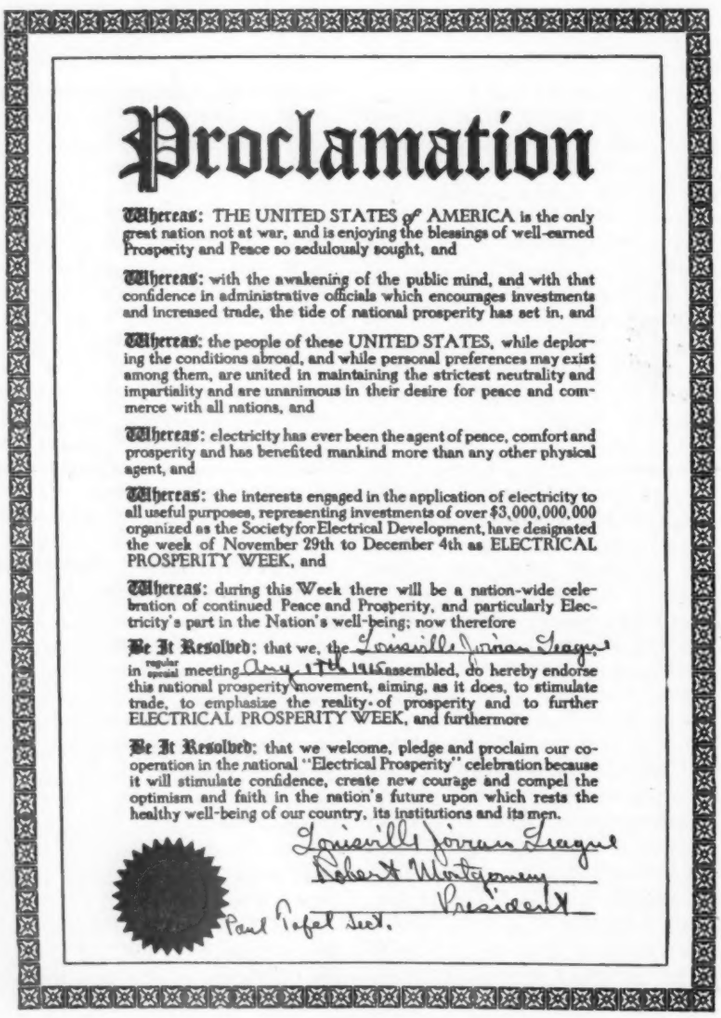
The installation consists of 257 1000-cp., 20-amp. series-burning gas-filled tungsten lamps and 288 600-cp., 6.6-amp. series-burning gas-filled tungsten lamps, mounted on ornamental metal standards. The higher

candle-power units are confined to the immediate vicinity of the down-town section known as "the Diamond," a public square at the intersection of Federal and Market Streets and Wick Avenue.

A feature of the Youngstown installation is the use of a series transformer in the concrete base of each lighting standard which leaves the standard free from high-tension circuits. The standards are spaced from 50 ft. to 75 ft., opposed, on down-town streets, which affords an unusually high light intensity. The light center of the lamp is 14 ft. 6 in. above the curb line of the street.

The Chamber of Commerce of Youngstown felt that the occasion deserved a fitting celebration, and an enormous night parade was arranged. Prizes were given for the best decorated floats, and many beautiful floats were in line. The Electrical Maintenance Company of Youngstown furnished an exhibit of a motor. This motor consisted primarily of a Rauch & Lang automobile, around which a wooden frame was constructed and covered with poultry netting to conform to the general outlines of a large induction motor. Over this poultry netting were stretched festoons of paper flowers of various colors, with a name plate on each side outlined with about 400 3.8-volt miniature lamps, wired to operate from a 6-volt battery. The pulley was about 24 in. in diameter with a 20-in. face and had five rows of 4-cp., 6-volt round lamps arranged around the circumference of the pulley and connected to a flasher within the car so as to give it the appearance of a revolving pulley. The interior of the pulley was lined with red festoons and paper streamers and had seven 11-volt, 5-watt lamps, operating from the 80-volt battery in the car. In addition an 8-in. electric fan was placed in the rear of the pulley, forcing the air and the streamers out, giving the effect of light being made from the machine.

The installation was made by the Mahoning & Shenango Railway & Light Company of Youngstown, under the direct supervision of Mr. E. H. Bell, manager. Messrs. H. Whitford Jones & Company of Cleveland, consulting engineers, were retained by the city to supervise specifications for the installation, which the railway and light company is under contract to operate for a period of ten years. The standards were supplied by the Union Metal Manufacturing Company of Canton, Ohio, and the lamps by the Banner Lamp Division, National Lamp Works of the General Electric Company, Youngstown.



Proclamation

Whereas: THE UNITED STATES of AMERICA is the only great nation not at war, and is enjoying the blessings of well-earned Prosperity and Peace so sedulously sought, and

Whereas: with the awakening of the public mind, and with that confidence in administrative officials which encourages investments and increased trade, the tide of national prosperity has set in, and

Whereas: the people of these UNITED STATES, while deploring the conditions abroad, and while personal preferences may exist among them, are united in maintaining the strictest neutrality and impartiality and are unanimous in their desire for peace and commerce with all nations, and

Whereas: electricity has ever been the agent of peace, comfort and prosperity and has benefited mankind more than any other physical agent, and

Whereas: the interests engaged in the application of electricity to all useful purposes, representing investments of over $3,000,000,000 organized as the Society for Electrical Development, have designated the week of November 29th to December 4th as ELECTRICAL PROSPERITY WEEK, and

Whereas: during this Week there will be a nation-wide celebration of continued Peace and Prosperity, and particularly Electricity's part in the Nation's well-being; now therefore

Be It Resolved: that we, the Louisville Jovian League in regular/special meeting Aug. 17th 1915 assembled, do hereby endorse this national prosperity movement, aiming, as it does, to stimulate trade, to emphasize the reality of prosperity and to further ELECTRICAL PROSPERITY WEEK, and furthermore

Be It Resolved: that we welcome, pledge and proclaim our co-operation in the national "Electrical Prosperity" celebration because it will stimulate confidence, create new courage and compel the optimism and faith in the nation's future upon which rests the healthy well-being of our country, its institutions and its men.

Louisville Jovian League
Robert Montgomery
President
Paul Pafel Sect.

Washington Power Hearing Concluded

Hearings were held before the Public Service Commission of the District of Columbia on Aug. 26 and 27 to inquire into the intercorporate relations of the Washington Railway & Electric Company and the Potomac Electric Company with respect particularly to the terms under which the Potomac Electric Company furnishes electrical energy to the railway. Among the witnesses were Clarence P. King, president of the Washington Railway & Electric Company; William F. Ham, vice-president of that company, and L. E. Sinclair, superintendent of the Potomac Electric Company. A previous contract between the companies is said to have provided that the railway pay the power company 6 per cent interest on the value of the plant used in the production of electricity for railway service and a profit on such energy as was used by the railway. Extension of the plant of the electric company being deemed advisable, the railway guaranteed the interest on certain improvement bonds of the electric company, and the power contract between the companies was accordingly modified. The railway load had enabled the power company to generate on a large scale and the cost of production had as a result been reduced more than half, while the number of consumers had increased from about 6000 to 20,000. The commission has taken the case under advisement.

Relative to this case, the commission in its annual report expressed the opinion that the close relationship between the Washington Railway & Electric Company and the Potomac Electric Power Company is not for the benefit of the public. It therefore submitted to Congress a draft of a bill which would result in the complete separation of these two companies with recommendations for its passage. The bill was not reported out of committee.

In its annual report for 1914 the commission also said that it had not established rates for service for the reason that the rates will depend on the value of the property and that the valuations had not yet been completed. On Aug. 23 E. W. Bemis, director of the valuation bureau, and Charles L. Pillsbury, his assistant in immediate charge of the work of valuing the properties of the public service corporations in Washington, D. C., reported to the Public Utilities Commission on the progress of the work. By November, Mr. Bemis says, the commission will be in possession of sufficient information to enable it to take up the rate question.

IRRETRIEVABLE WASTE OF CONSERVATION

National Conference of Governors Is Told Government Control of Water-Powers Hinders Development in the Northwest

At the annual conference of Governors which was held at Boston, Mass., last week, and at which about forty present and former chief executives of States were in attendance, Governor Ernest Lister of Washington and Ex-Governor James H. Hawley of Idaho showed to what extent electricity was used in the development of the Northwest and how the future development of that section of the country is hindered owing to the policy of the federal government regarding water-powers on the public domain.

Governor Lister on Water-Power Conservation

The principal address of engineering interest at the conference was by Governor Ernest Lister of Washington on "Water-Power Conservation." The speaker emphasized the irretrievable daily waste of energy which accompanies undeveloped flowage. In Washington more available water-power exists than in any other State, and the available and developed water-power of the Pacific Coast States is as follows:

	Available Hp.	Developed Hp.	Per Cent Developed
Washington	4,932,000	306,000	6
Oregon	3,148,000	105,000	3
California	3,424,000	430,000	8
Total	11,504,000	841,000	7.5

Continuing, the speaker pointed out the value of hydroelectric power in connection with the reclamation of arid lands, citing a single tract of 160,000 acres which awaits the construction of one hydroelectric development combined with pumpage from the Columbia River in order that it may become habitable and fertile. With the development of water-power every mile of railroad track in the State, which now contains 7386 miles of track, could be operated by electricity, with a great saving over the cost of coal-burning locomotive service. "Electrical energy furnishes the one means of irrigation pumping which is reasonable in cost," said Governor Lister, "and as for electrification, 750,000 hp. would operate all the railroads in Washington, preventing many forest fires, releasing much rolling stock for profitable transportation, and thus reducing the annual car shortage. The traveling public would appreciate the operation of passenger trains by electricity, and conservation of fuel would result."

In closing, Governor Lister paid a high tribute to the work of the Montana Power Company and the Chicago, Milwaukee & St. Paul Railroad in connection with the electrification of lines in Montana, quoting President Ryan to the effect that the cost of power to operate 450 miles of main line from Harlowtown, Mont., to Avery, Idaho, will be $550,000 a year, against a present fuel cost of $1,750,000. One of the most important results of electrification will be the practical elimination of the haulage of company coal cars, which at present requires one-third of the rolling stock. On the Butte, Anaconda & Pacific Railroad electric power costs but $96,000 a year for 80 miles of line compared with $270,000 in the coal-burning days. The possibilities in the way of the fixation of atmospheric nitrogen by hydroelectric power were also briefly mentioned by the speaker, who pointed out that 1,200,000 hp. is used in Europe for this work to-day, while not a single horsepower is devoted to this service in the United States, despite the probable exhaustion of the Chilean sources of supply in twenty years. Governor Lister favored the passage of a conservation law at the next session of Congress which will enable water-powers to be developed under conditions permitting a reasonable return to the investor, under State regulation, and with permanent easements subject to public ownership if necessary at some future time.

"State Control of Water-Power"

Ex-Governor James H. Hawley of Idaho pointed out that the indestructibility of the State is involved in water-power control. Under the federal constitution the power is reserved to the States to control the appropriation, flow and use of the waters of the State, except of navigable streams so far as their use for commerce is concerned. The right to use the waters means the right to use the abutting lands necessarily involved in perfecting such use. The great underlying principle of the water laws of the West is this right to acquire by appropriation, diversion and beneficial use the waters of the streams involved and an easement over the lands necessarily crossed by the conduits conveying the waters of the stream to the place of intended use. In the author's opinion, the fact that all the public lands are held in trust by the United States for the people of the whole country does not justify an attempt to exercise ownership over the waters of the stream to which the land is riparian.

The ownership of the water being undoubtedly vested in the States, and the water-power of the intermountain States being their most valuable asset, an arbitrary refusal on the part of the United States to dispose of such lands so that they can be used by the owners of the water will in many cases render such water valueless because it cannot otherwise be utilized for power purposes, and places the general government in such a position that it can coerce the appropriator into abandoning his property or receiving but small benefit therefrom. The government as effectually "holds up" the unfortunate developer as does the highwayman who takes his victim's property while covering him with a gun.

The Ferris Bill

The author then took up the Ferris bill, now on the Senate calendar for consideration at the next session of Congress, pointing out that in his opinion the most vital objection to the bill is to the provision of Section 7, which permits the Secretary of the Interior to choose the agent who shall be in charge of the public use within a State; that portion of Subdivision 8 which authorizes the Secretary of the Treasury to fix such charge under the guise of rental as he may deem proper for the use of the public land and to base this charge, not on the reasonable rental value of the land but on the amount of power developed and sold by the lessee regardless of where such power is developed, thus making the charge an excise tax on the industry instead of compensation for the benefits enjoyed, and the provision of Subdivision 9 which permits the Secretary of the Interior to regulate the service and the rates to be charged for service, and the issuance of securities by the owner of the plant, in States where there are no public utility commissions, which authorizes the federal government to determine whether or not a State is properly controlling its public service, and permits the federal government to assume control if it does not approve of the State's methods.

In the author's view, the national government's authority should not be stretched to cover intrastate matters by virtue of its ownership of the public lands. Laws conferring control in interstate matters should be uniform in their nature. The Ferris bill lacks uniformity in that it applies only to the public lands and thus leaves free from regulation exactly similar industries operated under identical conditions except that private

land is used in the conduct of operations. No serious attempt is made by the friends of the bill to deny that by this legislation it is intended to vest in the government of the United States powers which have hitherto been exercised wholly by the States. It is urged on the score of expediency. The proposed legislation is ostensibly a conditional grant for a limited time of the right-of-way over the public domain for hydroelectric power uses. In reality it amounts to an effort to establish a new system of government for the control of all future water-power industries using in any way the public domain, vesting all authority in the federal government. The principles upon which this legislation is based apply with equal force to every conceivable use of the public domain, so that the menace to the present system of government is by no means limited to the control of water-power. The difficulty seemingly comes from a failure to distinguish between the powers of the United States as a government and its right in the public domain as a land owner. The author held that the interests of the United States in the public domain were mere proprietary interests, subject in all respects to the power vested in the States.

If, the author held, the United States should properly have those powers which it is seeking to obtain and exercise through the Ferris bill, they should be secured through constitutional amendments and not by legislation which will subject important industries to a double control and which cannot fail to result in conflicts between the individual States and the federal government and thereby give a death-blow to the industries involved. No matter how great an evil may be, it is of first importance that the remedy be worked out in accordance with law. The rental system proposed by the bill will make values uncertain and prevent the ready sale of bonds for new enterprises. The worst feature of the bill is that thereunder the ownership of the abutting lands will give absolute control over the use of the adjacent water-power. The communities that will most benefit by a hydroelectric development should have a controlling interest in any decision reached as to the control of abutting lands. The right of eminent domain cannot be exercised against the public lands. The future prosperity of the inland Northwest depends upon the development of hydroelectric power, which should be in advance of markets.

Opportunities on Pacific Coast

Closing, the author outlined the possibilities of electric service in the intermountain region, and contended that those desirous of engaging in water-power development should not be hampered by uncertainties preventing the procuring of capital at low interest rates or handicapped by being compelled to pay charges to the general government which the owners who have previously acquired power rights are not required to bear. Give to the States the same right of control over power sites as they already have over the water which generates the power, he argued, or, if this be impracticable, give opportunity to the would-be investor to acquire the absolute title to such power sites, in the same easy manner that title can be procured to government lands for other purposes and at such reasonable cost as may be determined beforehand by the proper government officers. There will be no possibility of hurtful monopoly of power facilities with public utility commissions existing in every State wherein electric power is being developed in an extended way. If the public lands had not been donated to settlers by the general government but retained by it, immense values would have been finally received, but the development of the country would have been retarded for centuries, and many of the greatest States would still be weak territories instead of populous, wealthy communities. By facilitating the development of water-powers in the intermountain States, the Far West will be fitted to perform its whole duty in the defense of the country and bear its full share of public and private burdens.

ECONOMY IN STREET LIGHTING

Saving of $400,000 Effected in New York City by Substituting Incandescent Lamps for Arc Lamps

In his annual report for 1914 William Williams, commissioner of the Department of Water Supply, Gas and Electricity of the city of New York, shows what savings were effected in the lighting of streets, parks and public buildings by the substitution of incandescent for arc lamps. At the beginning of 1914 there were 2643 miles of street and 19 square miles of parks to be lighted. There were over 40,000 electric lamps and 45,000 gas lamps. The administration set out to make certain savings, and the methods pursued and changes made are given in the report. Two net results stand out—the street lighting bill for 1915 will be $400,000 less than for 1914, and the nitrogen-filled tungsten lamp has largely supplanted the arc lamp. As a result it is believed that Fifth Avenue, Seventh Avenue and several other important streets of Greater New York are among the best-lighted thoroughfares in the world.

The use of the nitrogen-filled tungsten lamp is being rapidly introduced all over the city. The commissioner states that there are still further improvements in contemplation, including the substitution of electricity for gas throughout the entire borough of Manhattan, thereby furnishing double illumination (at the points now lighted by gas) at a somewhat reduced cost. Before the end of the year it is confidently expected that 15,000 gas lamps will be displaced by electric incandescent lamps.

To light the public buildings of New York costs the city over $1,000,000 a year, and there, too, the administration has succeeded in effecting considerable economies. On most of the bridges arc lamps have been displaced by 300-watt nitrogen-filled incandescent lamps, and the annual cost of lighting the Queensboro Bridge was reduced in this way by $4,000. Similar savings were effected on all of the other great bridges across the East River and many of the numerous buildings and armories owned by the city.

In round numbers, the cost of lighting the streets and parks of Greater New York was $3,382,000 in 1913. The city has contracts for street and park lighting with the following companies: In Manhattan, the New York

FIFTH AVENUE, NEW YORK, LIGHTED WITH GAS-FILLED TUNGSTEN LAMPS

Edison Company and the United Electric Light & Power Company; in the Bronx, the New York Edison Company, the Bronx Gas & Electric Company, and the Westchester Lighting Company; in Brooklyn, the Edison Electric Illuminating Company and the Flatbush Gas Company; in Queens, the New York & Queens Electric Light & Power Company and the Queensboro Gas & Electric Company; in Richmond, the Richmond Light & Railroad Company. The term of the contract is limited by statute to one year. The rates for nitrogen-filled tungsten lamps in Manhattan during 1915 are $70 a year for the 300-watt lamps and $77 a year for the 400-watt lamps. The cost of arc lamps was reduced from $90 to $85. Rates equally favorable were obtained in the other boroughs. At the time of the report over 13,000 gas-filled incandescent lamps were burning on the streets of the city, including all its boroughs.

"Edison Day" and Boys' and Girls' Lamp Sales Contest

October 21, "Edison Day," the anniversary of the invention of the incandescent lamp, is this year to be made the objective date of a thirty-day lamp sales contest to be taken part in by schoolboys and schoolgirls throughout the country. To the boy getting orders for the largest number of watts rating of Edison Mazda lamps the Edison Lamp Works of the General Electric Company, Harrison, N. J., have offered a motorcycle worth $275, and to the girl making the corresponding best record an Edison phonograph worth $200. In all, 2033 prizes are offered, representing an outlay of $2,500 for awards. A widespread popular advertising campaign is being conducted during September and October to inaugurate this schoolchildren's sales contest and to disseminate the house-wiring propaganda which is also a feature of this year's Edison Day program. More than 100 magazines and Sunday newspapers are to be used, having a total circulation of 18,000,000, to tell the story of Edison Day and its associated events. In addition, there have been printed and distributed many millions of bill posters, blotters, car cards and signs. The contest has been particularly designed to bring about the sale of tungsten lamps to many small users who are not ordinarily purchasers of these lamps. Actual sales will be handled by the manufacturer's regular local agents and central-station representatives, and the boys and girls will be credited one point for each watt of lamp rating for which they obtain orders.

Engineers Forming Reserve Corps

The movement begun in a tentative way last spring to form a reserve corps of engineers to be available in case of war has assumed definite form, according to announcements made by Mr. Bion J. Arnold of Chicago, chairman of the A. I. E. E. committee of the proposed reserve corps of engineers.

Some time ago the suggestion was taken up by the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Consulting Engineers. Each of these organizations appointed committees to further the movement, which has now become more closely consolidated by the appointment just announced of the chairmen of various committees as members of a joint committee to take charge of the work in co-operation with the War Department. The members of the committee are as follows: William Barclay Parsons, New York, chairman, and Henry S. Drinker, Pennsylvania; William H. Wiley, New York; B. J. Arnold, Illinois, and Ralph D. Mershon, New York.

MUNICIPAL ELECTRICIANS' CONVENTION

Discussion on National Electrical Safety Code, Its Status and Means of Enforcement

The International Association of Municipal Electricians, in addition to its action on the subject of concentric wiring, as reported in last week's issue of the ELECTRICAL WORLD, considered matters affecting the Bureau of Standards and various other topics at its annual meeting at the Hotel Gibson, Cincinnati, Ohio. The sessions extended from Aug. 24 to Aug. 27. While much time was devoted to fire-alarm and police-telegraph signaling, the activities of the association were enlarged materially, as is shown by the presentation of papers and committee reports on a number of matters involving relations between municipalities and public utility companies. An abstract of Dr. Rosa's paper on the work of the Bureau of Standards is given on page 527 of this issue.

National Electrical Safety Code

W. J. Canada, electrical engineer, Bureau of Standards, read a paper on "The Scope and Present Status of the National Electrical Safety Code." This code, on which the bureau has been engaged for two years, will be presented on Oct. 27 at Washington to a formal conference of representatives of State commissions, municipalities and national associations for final amendment, ratification and adoption for one year's trial. A permanent conference, meeting at convenient intervals and representing utilities, insurance interests, cities and States, will undertake, together with the bureau, to amend the code as experience requires.

During the discussion Mr. Canada said that the bureau had not thought that it would take jurisdiction in connection with the rules. John W. Bleidt, Little Rock, Ark., asked whether the rules could be enforced. Mr. Canada said that he felt that if any State or city adopted the code even by reference it would have a standing which would be recognized. The bureau, however, is rather tending to discourage mandatory action. Dr. Steinmetz said that the most effective way of enforcing such a code would be through the action of juries in accident cases. If it were shown in case of accident that the code had been violated, that would be a most powerful force in influencing the adoption of the rules. Mr. Bleidt said that in a case at Little Rock the court had held that rules must be specified word by word if legislation is to be legal. Mr. Canada emphasized the desire of the bureau to make the rules workable and applicable to the problems of new and old construction in a practical, economical way.

President Flandreau went over the correspondence with the bureau which resulted in the appointment of the following committee to attend the conference at Washington on Oct. 27: R. A. Smith, Norfolk, Va.; A. C. Farrand, Atlantic City, N. J., and Warren E. Fastnacht, York, Pa.

John Price Jackson, commissioner of the Department of Labor and Industry of the State of Pennsylvania, prepared a paper on "Uniform Electrical Standards for Dealing with the Life Hazard," in which he suggested that all bodies join in helping toward the adoption of a national electrical code by first drawing up as complete and effective a code as possible to be adopted by the States and cities as recommendations to manufacturers, consumers and others affected, and, secondly, by

extracting from this ideal and complete code such rules and regulations as at the present day are essential to remove unreasonably serious life hazard from the electrical industry, or such less important ones as can be enforced without unreasonable burden.

Reports of committees on municipal lighting, electrolysis and overhead-line construction in municipalities were received.

Walter Bischoff of W. N. Matthews & Brother, Inc., St. Louis, gave a talk on the Jovian Order. He mentioned the co-operation which the Jovians will give in the celebration of "Electrical Prosperity Week."

A new constitution and by-laws were adopted. The next convention will be held in Baltimore, Md.

W. H. Flandreau, president of the association, Mount Vernon, N. Y., read a paper on "The Responsibility and Importance to the Public of the Office of Municipal Electrician or Superintendent of Fire and Police Telegraph." He showed the danger of political appointments to this office, and said that as a rule municipal electricians do not receive salaries commensurate with the responsibilities and importance of their office.

Other papers presented were as follows: "Fire-Alarm Systems for Industrial Plants," Albert J. Cross, Gamewell Fire Alarm Company, New York; "Storage Batteries for Fire-Alarm Purposes," H. M. Beck, Electric Storage Battery Company, Chicago; "Police Patrol and Fire-Alarm Records," Price I. Patton, Philadelphia, Pa.; "Lightning Protective Apparatus for Fire and Police Telegraph Circuits," L. S. Brach, Newark, N. J.; "Discussion of Standards for Fire-Alarm Installations," F. A. Raymond, National Board of Fire Underwriters, New York; "The Fallacy of Placing Fire and Police-Alarm Wires in Telephone Cables," C. E. Convers, San Antonio, Tex.

Election of Officers

The election of officers resulted as follows: President, Walter H. Flandreau, Mount Vernon, N. Y.; first vice-president, Dr. C. P. Steinmetz, Schenectady, N. Y.; second vice-president, Frank T. Brooks, Indianapolis, Ind.; third vice-president, Claude E. Convers, San Antonio, Tex.; fourth vice-president, L. S. Bosley, Springfield, Ohio; secretary, Clarence R. George, Houston, Tex.; treasurer, C. E. Diehl, Harrisburg, Pa.; executive committee, Robert J. Gaskill, chairman, Fort Wayne, Ind.; John Thomas, Scranton, Pa.; D. H. Fisher, Cincinnati, Ohio; R. C. Turner, Atlanta, Ga.; Joseph McCauley, St. Paul, Minn.; William Thompson, Richmond, Va.; Charles Gaul, Louisville, Ky.; William P. Briggs, New Bedford, Mass., and Emil H. Schmidt, Rochester, N. Y.; finance committee, F. K. Shinnen, chairman, Atlantic City, N. J.; A. L. Pierce, Wallingford, Conn., and P. J. Beisel, Allentown, Pa.

New York Electrical Exposition

The Electrical Exposition and Motor Show of 1915, the ninth of its kind, will open Oct. 6 for a run of ten days at Grand Central Palace, New York City. The United States government, including the Army, Navy and Treasury Departments; the great electrical and allied industries, and the New York City Board of Education will co-operate in adding interest to the exposition, which has the support of all the local lighting companies.

The Springfield Arsenal will show the manufacture of rifles and sabers. The signal corps of the Eastern Division of the army will have an exhibit of all communication apparatus used by a modern army in the field, including wireless, telegraph, telephone and various signaling devices. The United States Navy will prepare a 5-kw. wireless sending and receiving station and central generating station of a dreadnought. The Treasury Department will exhibit a machine for washing, drying and ironing paper currency.

Among the industrial exhibits will be an ideal dairy and a modern bakery operated by electricity.

The New York City Board of Education will exhibit the work of pupils of the Manhattan Trade School for Girls and Vocational School for Boys.

Demonstrations of its transcontinental telephone line in connection with brief lectures upon the development of the telephone in this country and the construction of the transcontinental line itself will be made by the American Telephone & Telegraph Company. The New York Edison Company will have an interesting and educational array of exhibits. One of these, the work of its therapeutic department, will be a model hospital and clinic. About seventy-five different firms, in addition to the various lighting companies, will have space. The officers of the Electrical Show Company are: Arthur Williams, president; George F. Parker, vice-president and general manager; Dudley Farrand, secretary; Walter Neumuller, treasurer. The directors include the above officers and Frank W. Smith, W. W. Freeman, James R. Strong and James C. Young.

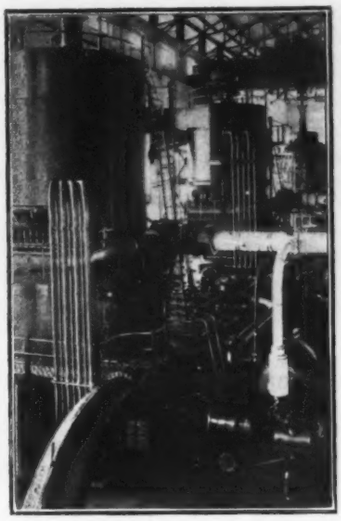
Electrical Exports for June

The June exports of electrical goods manufactured in the United States again show an increase over the corresponding month in 1914. The increase amounted to roughly $600,000, or about 30 per cent of the total exports in June, 1915. The most conspicuous increases were in batteries, of which the value was practically doubled; in insulated wire and cables, of which approximately $200,000 more was exported in June, 1915, than in June, 1914, and in metal-filament lamps, the exports of which were increased five times.

The total electrical exports for the year ended June 30, 1915, showed a decrease in comparison with the previous year of slightly over $5,000,000, or approximately 20 per cent. The principal decrease was shown in the motor trade, which fell off by almost $2,000,000. Batteries, interior-wiring supplies and metal-filament lamps alone showed increases, the latter having more than doubled its exports during the twelve months.

EXPORTS OF ELECTRICAL GOODS

	June		Twelve Months Ended June 30	
	1915	1914	1915	1914
Batteries	$113,950	$58,521	$967,146	$685,640
Dynamos or generators	191,464	199,955	2,013,130	2,634,365
Fans	48,106	22,717	258,309	432,656
Insulated wire and cables	253,247	74,294	1,911,850	1,992,304
Interior-wiring supplies, etc., including fixtures	70,915	51,354	753,351	721,069
Arc lamps	1,826	3,952	30,984	76,766
Carbon-filament lamps	11,432	3,094	101,923	172,064
Metal-filament lamps	78,536	15,719	473,149	219,439
Meters and other measuring instruments	41,214	.....	440,916	.....
Motors	283,923	231,003	2,817,743	4,541,541
Static transformers	70,543	75,392	624,483	1,455,343
Telegraph instruments (including wireless apparatus)	1,522	26,962	77,271	136,592
Telephones	44,342	69,717	1,149,361	1,552,951
All other	836,061	617,757	8,152,141	10,440,114
Total	$2,047,081	$1,450,437	$19,771,757	$25,060,844



What the Central Station Can Do

First, gather the local electrical fraternity together and unfold the plan. Get the electrical contractors and dealers interested, and tell them what Electrical Prosperity Week can be made to do in your town.

Enlist the home chamber of commerce, the editors of local papers, and the city officials in your campaign.

Put up electric signs and notices that the public may read. Include Prosperity Week "copy" in your newspaper advertising. During the week before the celebration install festoons of lamps along the sidewalk and outline your building.

Trim up your salesroom and windows in gala dress. On Monday of Prosperity Week hold an afternoon and evening reception, sending invitations to every customer, present or prospective. Provide music, and a flower for every lady.

Offer special easy-payment propositions to cover every appliance sold during Electrical Prosperity Week. Keep a register of every visitor to your display room.

Get the merchants interested in outlining their buildings, temporarily if not permanently. Photographs perforated with pin pricks will demonstrate the effect.

Carry the spirit of local festivity as far as possible. Install a slogan sign, if possible, with appropriate dedication ceremonies. Set apart one day, perhaps, as a local prosperity day.

Your Program for Electrical Prosperity Week

How to Localize the Buying Stimulated by the National Propaganda for Electrical Prosperity Week, Nov. 29 to Dec. 4

BY EARLE E. WHITEHORNE

Public interest in everything electrical will this fall be increased manyrold. The co-operative plans of the Society for Electrical Development to which manufacturers, central stations, jobbers and dealers and contractors have contributed both time and money will culminate this year in Electrical Prosperity Week—November 29 to December 4. In addition several manufacturing companies are planning fall campaigns to reach the final buyers of electrical apparatus, lamps and appliances. Added to this are the individual activities of local companies, the members of the Jovian Order, and the electrical industry as a whole. During the fall months, therefore, every force in what the selling specialist calls "demand creation" will be brought to bear on the final customer.

This magnificent co-operative effort, however, depends for its success not alone on the stimulating and forceful work of the few. Its final success will come from individual local plans. The movement as a whole will be of most benefit to those who put the most into it. Unless conditions change greatly there can be but one outcome to this culmination of individual effort—a most successful increase in business.

Your success, then, whether you are a manufacturer, central-station manager, jobber, dealer or contractor, depends upon matching your local plans with the massed publicity of the co-operative national plan. Your part lies in localizing and applying both the spirit and the purpose of the central idea, utilizing all the support offered by the Society of Electrical Development as well as by the individual manufacturers.

Suggestions for individual action here presented have been gathered by the editorial staff of the ELECTRICAL WORLD from the Society for Electrical Development, the chairmen of local committees, and representative men of the industry in all lines.

BEFORE any man can get a clear idea of this Electrical Prosperity Week project there are two things he must do. He must make a little investigation of the work that the Society for Electrical Development, Inc., has been accomplishing in the months that have gone by, and he must analyze the things that he himself can do to plant electrical prosperity in his town in this scheduled week with so strong a root that it will live and grow.

There is no space to list here the details of the work of the society. All these facts will gladly be provided if you will apply direct. The plan is this, that throughout the land this fall, in towns and cities, everywhere, from Nov. 29 to Dec. 4, the interest and attention of the public will be centered on this universal topic of electrical prosperity, and you must make the most of it. The name and fame of this electrical celebration will combine to make a market for you.

And how shall you make the most of it? You must plan a campaign that will be satisfied with nothing less than a united effort by every branch of the electrical industry in your town. Here is a schedule of concrete suggestions for the central station, the contractor, the dealer, and the manufacturer and jobber. Many you have heard before, some you have used and some forgotten, but they will aid you in the making of your program for Prosperity Week. And when you read them over and sit down with pad and pencil to lay out your plan, the opportunity will unfold itself before you, and the last question as to the practicability of such a campaign in your city will die.

The first and immediate step for the central-station sales manager is to gather the local electrical fraternity together and unfold the plan. Arrange an evening meeting, at which your employees shall be present, as well as the employees of contractors and dealers if possible, and tell them all about it. Tell them what the society has done, what the other central stations are planning, and what the week can be made to do for you. Make it a "whoop-la" meeting. Pledge every man to work for success.

Then go to the secretary of the board of trade, to the editors of the local newspapers, and to the city officials, and make an active canvass of personal calls to the prominent merchants and let them know about the project. Explain the value of the celebration to the city and to the merchants, how by installing the holiday illumination in time for Electrical Prosperity Week the

"shop-early" movement will succeed as never before.

Install an electric sign on the central-station office at least a month in advance, reading "Electrical Prosperity Week, Nov. 29-Dec. 4."

Post on the glass of your display windows notices of the coming celebration and what is being done in other cities in preparation. Impress the public with the magnitude of the affair.

During the week before the celebration install effective festoon lighting along the sidewalk in front of the central-station building and on the building front, this to be a special festival illumination for Prosperity Week.

Trim up your salesroom and your windows in carnival attire. Produce the atmosphere of a celebration as far as you can. Do not use Christmas trimmings—save those for later—but make the place bright and inviting.

Hold a reception in the office on Monday afternoon and evening of Electrical Prosperity Week, sending invitations to every customer and "prospect," and providing music, and refreshments electrically cooked, with a flower for every lady. Have special demonstrations of appliances. Show a permanent exhibition of every application of electricity that you can display by actual appliance and photograph.

Schedule a special demonstration for each day of the week, and advertise it in the daily papers.

Offer a special easy-payment proposition to cover every appliance sold during Prosperity Week.

Offer appliances in special "prosperity groups," in which the regular estimated cost of selling the appliances shall be deducted from its price when sold in the group.

Go over your register of guests on Wednesday and on Friday and check it off against your customers' list to find out those who have not responded. Then have a clever girl call them all up on the telephone and extend an urgent invitation.

On the last day of the campaign—on Saturday—hold a special charity bazaar—at which 10 per cent of all the money taken will be paid to charity. Do not advertise this sale until the night before so that regular business will not be affected. But advertise the charity sale on Friday evening. Notify the local clergy and the newspapers and play it up big. It will bring in lots of eleventh-hour business.

Get up a special Prosperity Week label for use on every package that leaves your store—one that will advertise electrical prosperity wherever it goes.

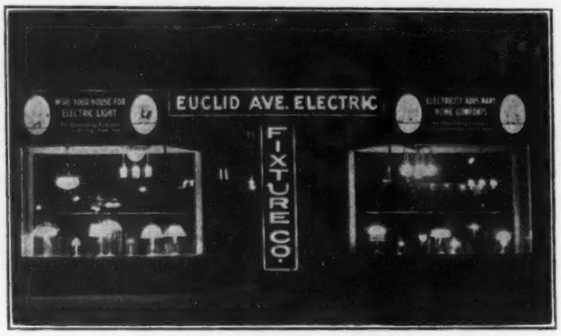
Call on the manufacturers for small envelope stuffer folders to advertise every kind of electrical appliance and show the largest possible variety of applications. Then prepare a Prosperity Week envelope that will carry a set of all these folders, and on its front tell the story of Prosperity Week and offer these evidences of prosperity. The prosperity envelope will be inclosed in your regular envelope and go to everybody.

Make up a sign to be pasted on the glass of every store where electricity is used for light or other purpose, a Prosperity Week sign that will be a notice that in this store electricity is used in every way possible to add to its cleanliness, coolness, safety, and so on. Publish a list of such stores in a newspaper advertisement that will herald them as modern. The merchants will be glad to benefit by the publicity they will gain by it.

Feature special Prosperity Week advertising in the newspapers. Use the theater programs this week and the back of street-car transfers too, if possible.

Arrange some bargain sale for every day, if it is only an extension cord that is featured. Cheapness need not be the particular point emphasized, but six special offers are easily possible.

If the charity sale is held on Friday evening or on



What the Contractor Can Do

Co-operate with the local electric lighting company in getting old houses wired.

Look over the stores and homes of your vicinity and determine which should be wired. Then go after that business and get it while the general atmosphere is surcharged with the publicity of Prosperity Week.

Look up the names of people for whom you have made installations, and have them let you make any necessary repairs and extensions. See that every socket is ready for service during Electrical Prosperity Week.

Remind customers and architects for whom you do work of the usefulness of plenty of outlets—especially chairboard outlets for appliances and extension lamps.

Tell your clerks and wiremen the meaning of Electrical Prosperity Week and get them interested in this big prosperity movement. More business for you means better wages for them.

Advertise Prosperity Week in your show window, in your newspaper space, and by word of mouth.

Form an Electrical Improvement Society in your block to make it the bright-light section of the city, and then make your store front the brightest of the lot. That merchant, for instance, should have an electric sign, and his neighbor's windows need modern lighting. Go after this business.

Offer your boy friends and neighbors some small electrical prize—a flashlamp or a toy motor—for getting you house-wiring business or finding "prospects."

What the Dealer Can Do

Plan and put in a series of attractive window displays leading up to Electrical Prosperity Week, remembering that moving displays get most attention.

Make your store the "bright spot" of the neighborhood. Light up store, windows and store front to the limit of possibilities during Prosperity Week and the weeks immediately preceding it.

Tell your customers about Prosperity Week.

Advertise it in your newspaper space, so that readers will connect your establishment with the widespread general publicity given the event.

Make your store as inviting to the public as it can be made. Arrange your stock to show off to the best advantage.

Plan a sale of household appliances and lighting goods. Get the women to coming into your store. They are the buyers of the family and the ones who decide where most of the domestic spending money shall go.

Tell your clerks and delivery men the meaning of Electrical Prosperity Week so they can boost, too. They will be interested. Your success is theirs.

Emphasize the "shop early" idea in the minds of Christmas buyers. Electrical Prosperity Week comes at the right time to be useful here.

What the Manufacturer Can Do

Emphasize to every member of your production and sales staff the meaning of Electrical Prosperity Week, and instill in your organization an understanding of the great things to be accomplished by stimulating every individual to maximum production and effectiveness. Tell your people the Prosperity Week plans at your staff meetings.

Issue to your dealers and agents suggestions for appropriate and attractive displays of your goods having a Prosperity Week significance. Lantern slides, newspaper electrotypes, window posters, pennants, etc., will aid in imparting your Prosperity Week enthusiasm to the local dealer.

Advertise Electrical Prosperity Week in connection with your own goods, and encourage agents to utilize local advertising appropriations in the same way. Suggest "Prosperity Week kinks" in your advertisements. Encourage news interviews by representatives of the city and local press with your officials and district agents. In these the broader significance of Electrical Prosperity Week to all should be pointed out. When the opportunity is afforded, have your men address gatherings on the subject.

Place Prosperity Week poster stamps on all your letters—perhaps even prepare special stationery and envelopes with an Electrical Prosperity Week message, for use by your office staff during the month preceding the big week. Booklets, circulars and stuffers offer other ways of tying your business up with the general prosperity movement.

Make your local offices brilliant with electric light during Prosperity Week—your factory, also, if it is near a traveled road or railway. Electric signs and special illumination will aid the effect.

What the Jobber Can Do

Explain Prosperity Week by talks and by mail to your men on the road.

Look over advertisements and catalogs of new specialties, particularly "lamp socket" devices and appliances for which there is an immediate demand.

Get out combination packages of goods, making the package help sell the contents and displaying the Prosperity Week idea. Combinations of electrical devices and appliances for the automobilist, the housewife, the professional man and the business man can be figured out, making the combination complete and ready to use.

Combine the appliances and sell the combination at a price which takes into consideration the fact that there is only one selling cost on the lot selected. A small desk fan, a cigar lighter, a double socket and suitable connecting cords might be so combined for a professional man's package.

Get out special order blanks for Prosperity Week offers.

Write a series of letters to dealers explaining first how the public is going to be urged to buy during the week of Nov. 29 to Dec. 4; second, what they are going to want to buy; third, what you have to sell in the way of special propositions, and fourth, the necessity of stocking at once in order to prepare for the demand.

Saturday afternoon, a clean-up sale can be staged on Saturday night, at which odds and ends of shopworn stock can be sold off.

If it is possible to stage a "house electric," either a miniature house within your salesroom or a complete house in the residence district, it should be done. It will be a popular feature of the celebration and will pay.

Offer a prize or several prizes to the school child who writes the best 500-word essay on "Electricity Your Servant," or some such topic.

Send out a list of "How to Do It Electrically" to every customer and "prospect"—a simple card enumerating all the different ways to utilize modern electrical service to make life easier.

Make a special proposition to merchants who will add to their installations before Prosperity Week. Offer easy terms, and print an advertisement in the paper describing every such installation and "boosting" for more. Make a special drive for advance Christmas outdoor lighting display. Distribute post cards of such installations.

Go to every merchant with a photograph of his building front perforated with pinholes to show the effect of display lighting. Offer expert advice on improving the lighting in store and windows.

Try to get every store to convert the panels under its show windows into showcases or transparency signs by putting in plate-glass panels well lighted from behind.

Display in your salesroom or window a big map of the city with every installation marked by cutting a star-shaped hole. Burn a lamp behind, to make the stars shine. Add new red stars for new installations—evidences of local prosperity.

Give an informal dinner to the local architects, builders and real-estate men and tell them how they can help electrical development and how it will help them.

Give a dinner to the druggists and hardware men and show them how they can sell electrical goods at a profit. Offer support in getting them started.

Make up a map showing location of all vacant houses and stores that are wired.

Put a special sign on every vacant wired house to advertise the fact that it is modern.

Offer the use of several toasters, percolators and chafing dishes to any restaurant that will feature its electrical equipment in Prosperity Week. Offer percolators to coffee stores for coffee demonstrations. Advertise all such stores in your newspaper space.

Arrange an exhibition of electrical appliances for the office and invite all local business men for a "private view" on Saturday night before Prosperity Week. Serve light refreshments and have a "get-together" party.

Put signs in barber shops, butcher shops and similar places, calling attention to the cleanliness of the electric way and the fact that this shop is up to the minute in equipment and service.

Arrange at once with merchants with suitable roofs for a special co-operative proposition to manufacturers of nationally advertised articles sold in that store. Try to get some big national advertisers' signs by Prosperity Week—the dealer offering the roof and you the service at a flat price. You pay for half the cost of the sign.

Work up a "made in your town" display to occupy one of your show windows throughout the week, to be changed each day, and feature articles and photographs of locally made goods. Advertise the display each day in your newspaper advertisement.

Carry the spirit of local festivity as far as possible. Raise money by popular subscription and install a slogan sign, if possible, with appropriate dedication ceremonies. Set apart one day as "Local Prosperity Day," with an industrial parade and an aeroplane exhibition

flight with a Prosperity Week banner flying from the airship. Have a band concert in the afternoon, with printed programs advertising electrical prosperity. Do everything you can think of to promote the carnival spirit and impress the public with the enterprise of your company.

In the same way, if you are a contractor or dealer, you can win your share of the business by planning for it.

Apply everything you can of the suggestions made here to central stations. Put up an electric sign and special display lighting. Dress up your store and windows and try to boost your sales in every way. Get every employee interested and boosting.

Co-operate with the other contractors and the central station and frame up flat-rate schedules for house wiring and make a Prosperity Week campaign, offering a special proposition on easy payments.

Advertise a "fix-it service," offering to call for any electrical appliance that is not working properly and repair it. Offer to convert all oil lamps to electric—"Special rates for Prosperity Week."

Put Prosperity Week placards on all your wagons. Increase your advertising in the papers and do all you can to boom the celebration of electrical prosperity.

Offer special sales of appliances and play up plugs, sockets, extension cords and other accessories that the central station does not feature.

Manufacturer and jobber can co-operate to put these local plans into practice. The manufacturers and jobbers can render a priceless service to the industry in the promotion of Prosperity Week by enlisting the co-operation of their traveling salesmen. These men must be impressed with the importance of spreading the news and stimulating the interest of their customers in the Prosperity Week project. Let them tell each contractor, dealer and central-station man, as they go from place to place, what is being planned and being done in other towns, and act as the pioneers of the movement.

The first thing to do is to get the salesmen together at one or two points and talk to them about the practical importance of Prosperity Week and how their line can be "hitched up."

In your advertising space in trade papers and popular magazines, play up the application of your goods to Prosperity Week and make your message link up strongly with the campaign.

Get in touch with other manufacturers of kindred lines and try to work up a co-operative plan for pushing the opportunity hard.

Line up the jobbers who sell your goods and get them to supplement your efforts in their influence on their customers.

Take these suggestions and see how well you can employ them in the promotion of a campaign for Prosperity Week that will break all records for electrical development in your town. Among them you will find many things that you have already done or thought of. You will recognize many ideas that you have heard of other people using. But you will see a few brand-new hints that may not have occurred to you at any time. And, old or new, it makes no difference, if the thought will help you make a better record of achievement. But, best of all, we have here down in black and white, in form convenient for your use, a list that you can use as the foundation for your local program, and when the program is once arranged the work may be said to be fairly started.

There is none too much time still available for all the preparation that must go before a really creditable campaign. With these suggestions as a basis, go to work to-day and make your plans complete. More light and power to you!

What the Local Merchant Can Do

"Electric" has come to mean "modern," "quick," "convenient," "easy to do" in the minds of thousands of everyday buyers. The local merchant can adapt all his sales plans for the week of Nov. 29 to Dec. 4 so as to take advantage of this public interest in everything electrical.

If you are a local merchant, you can hold an electric sale. You can have special illumination, special window displays and special-detail store arrangements.

Make a "magnet" window, arranging a group of best sellers in the shape of a horseshoe facing the street. Your local lighting company may have suggestions as to the details of such a plan.

If you are a grocer, you can have a special sale on goods which are trade-marked "Electric," making real electricity, in the way of lighting, help you sell goods so marked.

Buy an electric truck and advertise electric deliveries and promptness of service.

If your store is on "the wrong side of the street," make the public want to cross over by unique lighting and window display. Change the habits of the crowd. If your section is unattractive after nightfall because dark, form a local improvement association and light your street or block during Prosperity Week. You will probably decide as a result always to have a well-lighted block.

Make your windows "live" by various electrical methods. Electric motors, lights, fans, magnets, and so on, all can be adapted. Ask your local lighting company.

What the Salesman Can Do

Talk Electrical Prosperity Week to your customers, to your friends, among your associates, to the man on the street, to your fellow-traveler in the smoking-car, to your acquaintance in the hotel lobby, to the hotel clerk, and, in short, to everybody you meet.

Equip yourself to answer correctly questions that may be asked concerning the significance of Electrical Prosperity Week and the plans which have been made for bringing better business to everyone—both inside and outside of the electrical industry.

Boost the other fellow's game. If, for example, you sell motors, put in a good word for electric lighting when you can. Suggest tungsten lamps and more light when you see the dismal glare of an old carbon-filament installation. If a lighting man, look about you and see where motors would save labor and money for your customer. Ask your hostess if she has and uses an electric iron and toaster. Explain to her that electric cooking nowadays is economical for any housewife. And tell them all about Electrical Prosperity Week.

Let no chance slip to bring central-station man, dealer, contractor and manufacturer into friendly co-operation. Co-operate yourself, and help others to help another.

Remember that, after all, the whole accomplishment of Electrical Prosperity Week is in your hands, and that the salesman, more than any other single class in the electrical industry, can do the most to make the week one of real prosperity to the industry and to the public.

Good and Bad in Recent Lighting Development

Importance of the Principle of Diffusion in Modern Systems of Illumination Using Brilliant Light Sources

BY J. R. CRAVATH

NEARLY all of our improvements in the efficiency of electric light have involved an increase in the brightness or intrinsic brilliancy of the sources of light. Consequently, with each new improvement has come the necessity of a more careful use of concealing or diffusing equipment on the improved illuminant to avoid strain to the eyes of the user. The introduction

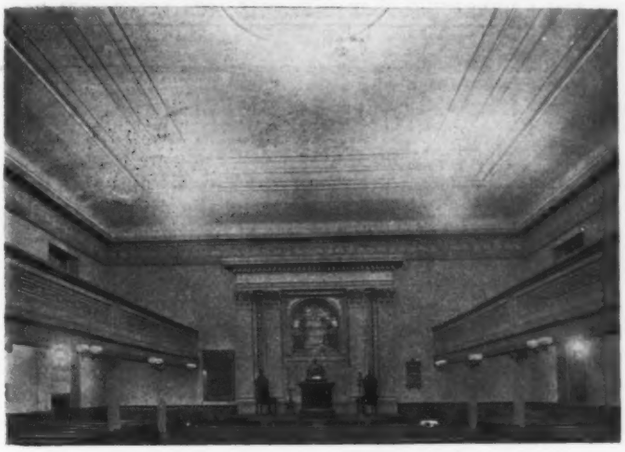


FIG. 1—NIGHT VIEW LOOKING TOWARD PULPIT

of the gas-filled incandescent lamp is making revolutionary changes in efficiency and color. There are many cases, however, where its increased efficiency might better be used to make possible efficient lighting from better diffused sources instead of increasing the light from insufficiently diffused sources, thus adding to the comfortableness of an installation rather than merely adding to the quantity of light regardless of quality.

Of course, it is true that the intrinsic brightness or brilliancy of the unshaded gas-filled tungsten lamp is so great as practically to force some method of diffusion upon the intelligent user. In such cases the increase in brightness automatically accomplishes the desirable end of causing diffusing equipment to be used.

Although a diffusion of the light of the intensely bright filaments of these lamps is recognized by the majority of users, not enough care is being taken in many installations to see that the diffusion is sufficient for the best comfort and efficiency of the eyes. In other words, while the necessity for diffusion is recognized by putting some kind of a globe around the lamp, there are altogether too many cases where no attempt is made to see whether the reduction in brightness brought about by the globe used is really sufficient for the purposes intended. It is simply a continuation and aggravation of the old trouble in getting semi-indirect lighting used in a proper manner. The term "semi-indirect lighting" is something for the salesman to juggle with. It may mean anything from very good to very bad.

Now, one of the principal deciding factors in the lighting of interiors as far as the comfort of the eyes is concerned is the brightness of the brightest visible source of light as compared to its surroundings.

For years nearly all who have studied the subject have realized that the brightness of the most artificial illuminants is too great to shine into the eye continuously without causing discomfort or annoyance to the majority of persons subjected to it. The term "glare" began to be applied to the unshaded and undiffused light of the arc and incandescent lamp, but the limits of good practice were undetermined. After the studies of the past few years, it is now possible to lay down conservatively a much more definite limit as to what constitutes "glare," glare being defined as light shining into the eyes in such a way and of such quantity as to cause discomfort, annoyance, fatigue or interference with vision.

A study of the measured values of brightness existing in typical interior-lighting installations shows that for this class of work the brightest visible source of light should not exceed the brightness of the illuminated surroundings by a ratio of over 1 to 100, or possibly in some cases a little more than this. While greater ratios than this may be considered good practice where the occupants of the room do not face the brightest visible sources of light continuously, the foregoing figure probably expresses somewhere near the limit of good practice where the maximum comfort and efficiency of the eye is desired.

Now, if we specify that the brightest visible source of light is not to exceed the brightness of the illuminated surroundings of such a source by more than a certain ratio, it is evident that we cannot lay down a rigid rule as to the maximum brightness of globes, bowls or ceilings to be permitted within the limits of good practice. The brighter the surroundings, the brighter the brightest source of light may be. It can, however, be made a rule that if in a given size of a diffusing bowl a given size of lamp does not produce contrasts of brightness above the limits of good practice in a given room, then an increase in the size of the lamp, although it increases

FIG. 2—NIGHT VIEW OF CHURCH INTERIOR

the bowl brightness proportionately, also increases the brightness of the room in the same proportion, and hence is unobjectionable. Of course, one might conceive of a case where the size of a lamp might be increased so far beyond that ordinarily used for interior illumination for a given area that the brightness of the bowl might of itself be objectionable not on account of

the contrast with its surroundings but because of the intense brightness and large amount of light from the bowl.

A reference to natural illumination conditions may make this point plainer. When one looks at the sun the brightness of the sun's surface is so great that it makes little difference against what kind of background the

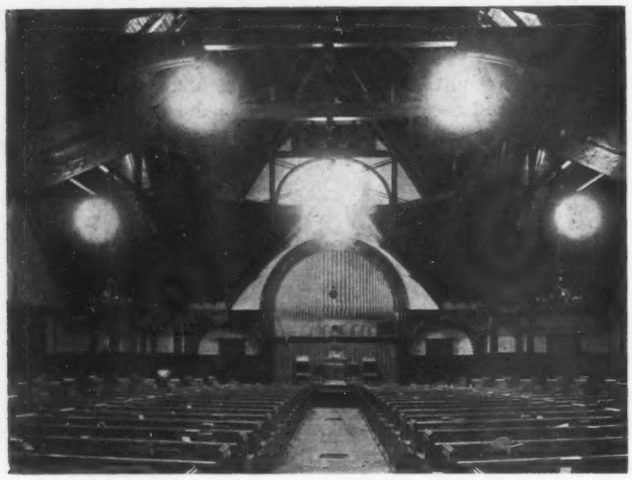


FIG. 3—NIGHT VIEW OF CHURCH INTERIOR

sun is seen. The effect is dazzling and blinding, and may be known as brightness glare. On the other hand, a normal eye, accustomed to a reasonable amount of "outdoors," experiences no discomfort under a clear blue sky in the open, although white clouds of from three to five times blue-sky brightness may cause some annoyance. However, when a patch of blue sky is viewed through a window the surroundings of which are dark, it may be very annoying and produce a case of contrast glare. So with the artificial illuminant and inclosing globe. The globe brightness which will cause discomfort depends upon the background. This, however, holds within the limit of ordinary illumination. It is conceivable that some day, were artificial lighting to become so cheap that it would be possible to obtain cheaply illumination exceeding that obtained from daylight, it might be that we should have to consider brightness glare as well as contrast glare, but at the present time contrast glare is the limiting factor, and that puts a much lower limitation on our light-diffusing equipment than would brightness glare alone.

Although it is almost impossible to lay down a rigid rule as to a given brightness of globes or bowls which should be permitted in the best practice without specifying the brightness of the background against which they are to be seen, nevertheless certain rough limitations can be outlined. For interior artificial illumination as it is being carried on to-day brightness exceeding 500 millilamberts or 465 apparent foot-candles is likely to make trouble. In highly illuminated interiors with very light-colored walls possibly this limit can be exceeded, and, on the other hand, it is probably too great for dimly illuminated interiors with dark walls and ceilings.

One of the bad tendencies coming within the scope of this article is the tendency to put anything in the shape of a glass with a "fancy" name around a gas-filled tungsten lamp and call it a diffusing globe or semi-indirect lighting. In the minds of too many this seems to "take the curse off" without regard to the actual brightness results obtained. As intimated before, the term "semi-indirect lighting" covers a multitude of sins, as well as a few excellent installations. The tendency is altogether too much to select globes and bowls of too light a density to cut down sufficiently the brightness to which the eye is exposed. Thus the glass manufacturers complain that the denser bowls which they make up for semi-indirect lighting find a very limited sale, which goes to show that there is much need of public education on this rather technical subject.

To illustrate some of the points I have tried to make as to the comfort of the eyes depending upon the contrasts presented, the accompanying illustrations taken from the examples of church lighting shown in the "Electrical Salesman's Handbook" of the National Electric Light Association are reproduced here. It should be explained that no criticism is intended of the installations illustrated, as the writer has seen few of them and consequently cannot tell what the real effect on the eye may be. A photograph is sometimes very deceptive. The illustrations are selected simply because, as shown by the photograph, they illustrate well the points regarding the contrast of brightness which have been made in this article.

In Figs. 1 and 2 the lighting is apparently largely indirect, from the ceiling, and in Fig. 2 it is supplemented by some light coming through diffusing glass. However, there are no marked contrasts of brightness to which the eyes of a person seated in the audience are subjected. In Figs. 3 and 4 a decidedly different state of affairs is evident. The sources of light are apparently in great contrast to the background. Presumably the interior finishes in Figs. 3 and 4 are so dark that it is difficult to avoid these contrasts. However, as a matter of fact, the sources of light are too bright for continuous facing in both Figs. 3 and 4. To avoid such a condition in a dark-finished interior it is necessary to use an unusually large expenditure of electrical energy. Thanks to the efficiency of the modern gas-filled tungsten lamp, it is possible to throw enough light to the ceilings and walls of such dark interiors to cut down the injurious contrast between light sources and backgrounds very materially. Such methods have not been heretofore commonly used on account of the expense, but it is to be hoped that they will be one of the developments of the future.

To sum up, the bad tendency in the present lighting practice is the increase of the brightness of light sources wihout corresponding counteracting means of diffusion. The good tendencies are (a) the increasing amount of attention given by those skilled in the art to proper

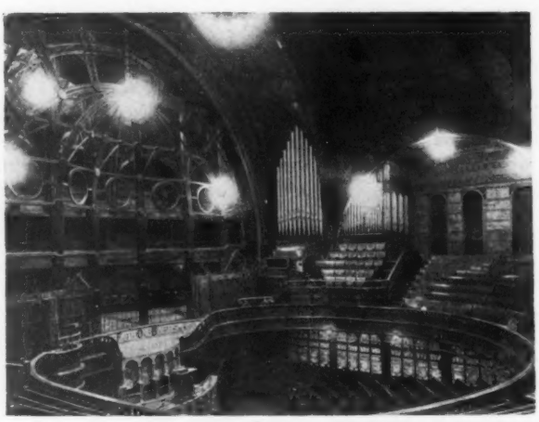
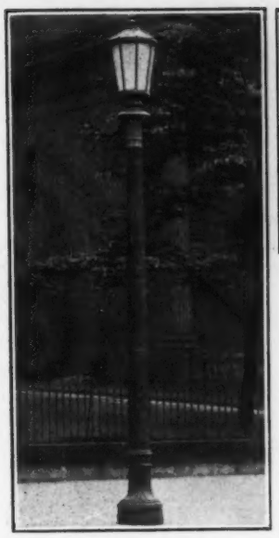
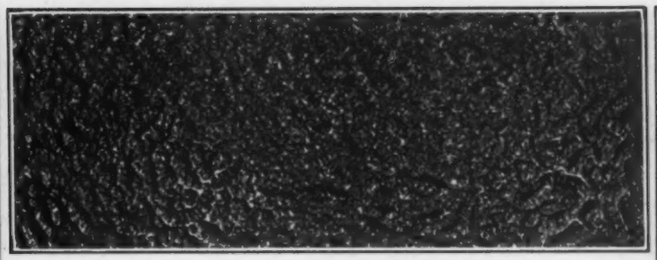


FIG. 4—NIGHT VIEW OF AUDITORIUM

diffusion; (b) the beginning of a tendency to study scientifically and measure the brightness conditions in a room as well as the illumination on the working plane, and (c) the increasing economy of producing light which makes it possible properly to illuminate dark-finished rooms where correct treatment has heretofore been prevented because of the expense.





THE CLEVELAND LANTERN BY DAY AND BY NIGHT, AND REPRODUCTION OF SURFACE OF DIFFUSING GLASSWARE

The Cleveland Lantern for Ornamental Lighting

BY WARD HARRISON

CLEVELAND is the largest of American cities to adopt the so-called ornamental or "white-way" form of lighting for its down-town district, and the installation to be made in this case will, when complete, form one of the most extensive systems of its kind.

A careful investigation led to the decision that single-lamp standards placed opposite each other and spaced at intervals of approximately 85 ft. along the street would best meet local conditions. Accordingly, fifty sample posts were erected at this spacing on one of the principal thoroughfares, and on these posts at least ten units of each type of illuminant submitted for trial were installed and operated over a period of several months. The data obtained from these tests, together with the investigation of practice in other cities, formed the basis for the most comprehensive analysis which has thus far been made of the comparative value of various electric illuminants for such service.

Requirements to Be Fulfilled

The requirements of a satisfactory ornamental lighting system were considered to be as follows:

1. A standard of dignified and pleasing appearance both by day and by night.
2. A uniform illumination of high intensity on the street and on the sidewalk.
3. An adequate illumination of the building façades with a sufficient degree of uniformity to satisfy the eye.
4. A sufficiently low intrinsic brilliancy and intensity in the direction of the eye to obviate any discomforting effect of glare.
5. Safety, simplicity and reliability of operation.
6. Moderate operating cost.
7. Ease of adaptation to further developments in the art.

In the choice of the system the Department of Public Service of the city of Cleveland was represented by Mr. Thomas Sidlo, director, and Mr. C. H. Kibbee, superintendent of street lighting. The municipal plant was represented by Mr. F. W. Ballard, commissioner of light and heat, and Mr. J. C. Johnson.

The light source which in the opinion of these judges most nearly fulfilled the requirements of the case presents a marked departure from previous practice and embodies several features which are new. The unit consists of a high-candle-power series Mazda lamp inclosed in an octagonal copper lantern as illustrated herewith. The artistic merit of the lantern and of the column supporting it is due to the work of Mr. Frederick H. Betz, city architect of Cleveland.

The engineering features of the lantern were developed by the engineering department of the National Lamp Works, Cleveland. The work of designing the lantern and securing the proper adjustment of its parts involved more than 2000 photometric readings. Fifty samples of glass obtained from domestic and foreign manufacturers were investigated for their suitability as inclosing material. These latter tests were considerably facilitated by a previous study of the transmission properties of diffusing glass.*

Details of Lantern Adopted

The over-all dimensions of the lantern as finally adopted are: Diameter, 20 in.; length, 30 in. The lantern will be supported at a height above the street of 15 ft. measured to the light center. From the cross-sectional view it is seen that the lamp is supported in a pendent position and that a band of Holophane refracting glassware surrounds the bulb throughout a zone extending from 25 deg. below to 30 deg. above the horizontal.

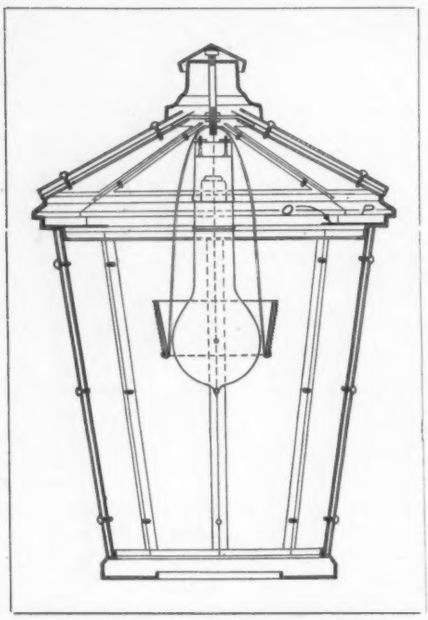
The purpose of this band is to divert into useful directions light which would otherwise escape at angles where it might be considered to do more harm than good, i.e., at angles immediately below the horizontal, where it would produce glare in the eyes of pedestrians, or just above the horizontal, where it would form a bright band on the buildings at the second-story level and tend to destroy the efficacy of electric signs placed at this height. At higher angles the least possible obstruction was afforded to the escape of light rays, so that the uppermost parts of adjacent structures might be adequately illuminated. The distribution of light is such that the variation in intensity over the entire façade of the buildings is so slight as to be scarcely discernible.

Selection of Glassware for Lantern

In order that the favorable distribution of light secured by the use of the refractor might not be nullified by the glass inclosing the lantern, it was essential that the latter should be of a type which would simply break up the light rays rather than diffuse them completely. This condition limited the selection to glasses whose diffusing properties were dependent principally upon an uneven or rough surface rather than upon their opal content. After testing out many such samples the

*E. J. Edwards, *Trans. I. E. S.*, 1914, Vol. 9, p. 1011.

choice finally narrowed down to two. The first of these, which may be designated as glass A, was a crystal glass having a rough surface, and the second, glass B, was similar to A except that it contained a scarcely perceptible quantity of opal. The photograph reproduced at the heading of this article conveys an idea of the texture of these glasses. Distribution curves for the lantern with

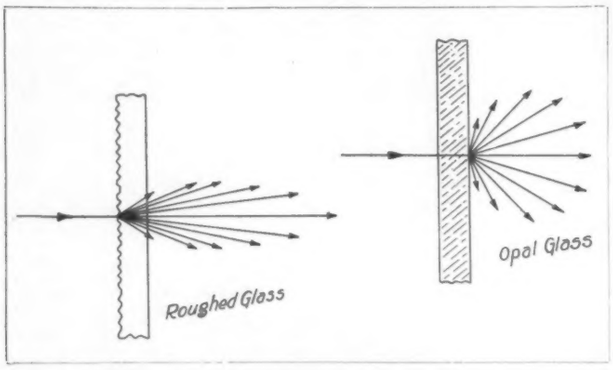


SECTION THROUGH LANTERN

each sample, using a 1000-cp. Mazda lamp, are also reproduced herewith. In both cases the zone of high candle-power is in the proper direction to provide the most uniform illumination of the pavement between units. Above this the intensity falls off rapidly and increases again only at angles through which illumination is supplied to the upper stories of the buildings. The angle of maximum candle-power may be adjusted for a closer or wider spacing of units by varying the relative height of the refractor band and of the filament center.

Comparison of the Curves

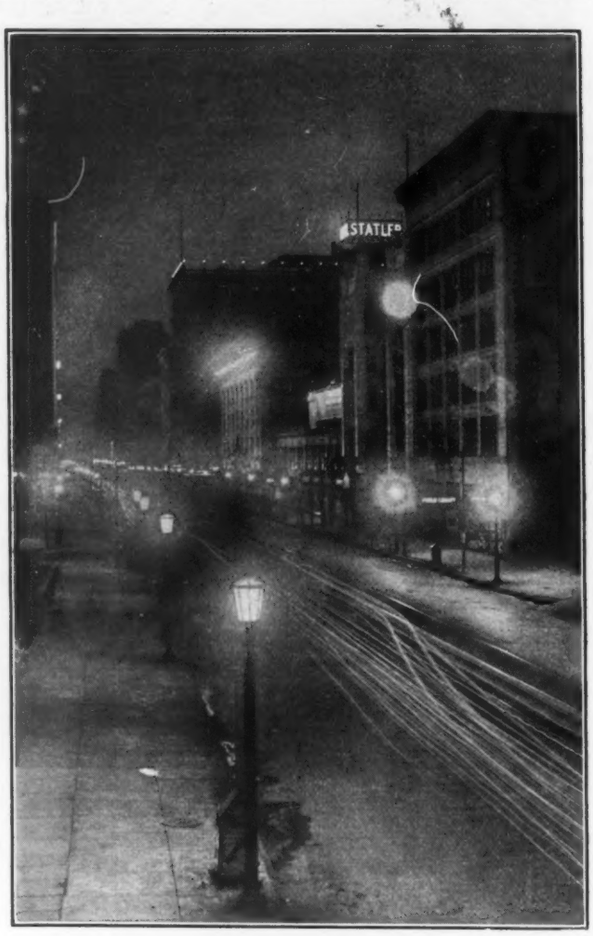
As a comparison of the curves will show, the introduction of a slight amount of opal in the glass rounds out



DIFFUSION IN ROUGHED AND OPAL GLASS

the distribution curve and decreases the maximum intensity somewhat. From the table it is seen that the over-all efficiency of the lantern with the first sample of glass is approximately 70 per cent and with the second 66 per cent. These values compare well with those which obtain for overhead units and seem especially good when one considers that in order to obtain a pleasing appearance the copper structure of the lantern was made so heavy as to intercept fully one-fourth of the light flux. On the other hand, its octagonal form permitted of the use of ribs less than 0.75 in. in width, and in that manner shadows were obviated even where inclosing glass of minimum density was installed.

The subdivision of the glass into small panels was also of advantage from the standpoint of maintenance cost, and the appearance of the fixture was found to be even more pleasing than when a fewer number of sides were used. The sides of the lantern were sloped somewhat to insure satisfactory illumination near the base of the standard. In all cases glass A was recommended for glazing the top. A reflecting disk shown at *O* in the sectional view was also inserted to improve the effi-

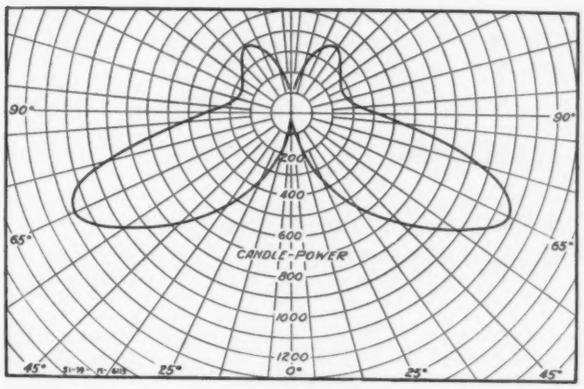


THE EXPERIMENTAL INSTALLATION ON EUCLID AVENUE, CLEVELAND

ciency of the fixture by eliminating possible cross-reflection in the pocket *P*. This disk also served to brighten the upper portion of the panels, but never in the course of the experiments was an effort made to have the entire glass surface appear uniformly luminous. Such a course would not only have involved the sacrifice of some of the most desirable qualities of the lantern, but in fact would have been to depart from the original motif of lantern design. From this standpoint there was much discussion as to the relative desirability of the two samples of glass submitted, but after both had been tried out on the street it was the opinion of the majority of observers that the crystal glass gave rise to too great contrasts in intensity, and glass B, containing a small percentage of opal, was chosen as more desirable.

Provisions for Cleaning

One of the important problems in the operation of any street-lighting system is that of keeping the units clean. It was this consideration which in large measure led to the investigation of pebbled or wavy glass surfaces for inclosing material in preference to the more common ground and frosted types. It was found that not only did the former surface acquire a deposit of



DISTRIBUTION WITH GLASS A—CRYSTAL GLASS HAVING ROUGH SURFACE

dust much more slowly, but it could be cleaned much more easily and thoroughly than any form of ground glass. Dust collection was further retarded by placing the smooth side of the glass outward and constructing the fixtures as nearly airtight as practicable without excessive expenditure. This procedure did not lead to other difficulties, for the reason that the radiating surface of the lantern was so great that no ventilation was required even with lamps of highest candle-power. Contrary to the usual practice, the refracting band of Holophane glass was not supplied with an outer envelope, for within the lantern the diffusing properties of such a casing were not required, and furthermore since all of the prisms were made to incline downward the accumulation of dust upon their surfaces would be inconsiderable. From experience gained with the trial units it was estimated that cleaning once in six weeks would maintain the interior of the lanterns in execllent condition. One of the panels is constructed in the form of a door which opens vertically and permits ready access for the replacement of lamps and the removal of refractors for washing.

Several hundred of the standards will be equipped with 1000-cp., 20-amp. Mazda C lamps, but for the sixty units surrounding the Public Square and for the most important thoroughfares 1500-cp. lamps have been chosen. The operating efficiency of these lamps is at present 0.45 watt per candle-power. The circuits will be supplied from the East Eleventh Street substation of the Cleveland municipal plant by 6.6-amp. tub transformers capable of carrying fifty lamps each, and the lamps in turn will be operated from individual series transformers placed in a hand-hole constructed in the street near the base of the post. These transformers have an efficiency of 93 per cent and are equipped with 22.5-volt and 34-volt taps, so that the two sizes of lamps may be used interchangeably. The high voltage insulation between the primary and secondary coils makes it entirely safe to work upon all parts of the system above the ground and replace lamps even when the circuits are in operation. The fact that each lamp is on a separate circuit also tends to minimize the possibility of trouble due to shorts, grounds or open circuits. The electrical characteristics of the transformers are such that without any change in taps immediate advantage can be taken of such improvements in lamp efficiency as may reasonably be expected and as will in general tend to lower the wattage consumption of units of a given candle-power.

Comparative Cost of Arc and Incandescent Units

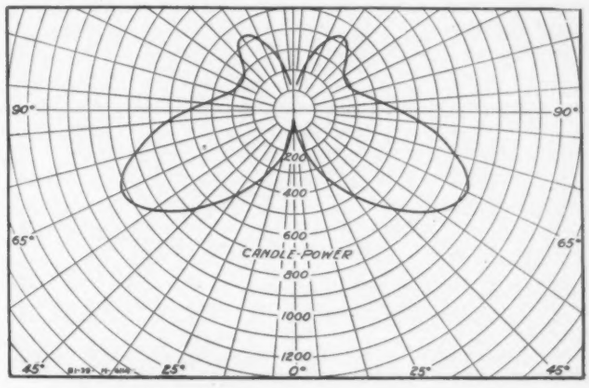
A résumé of the Cleveland lighting situation from the standpoint of operating cost with both arc and incandescent units is of particular interest. In the present case it was well shown that a judgment of comparative economy based simply upon watts-per-candle-power is as likely to lead to an erroneous conclusion as if any other single item, such as first cost or maintenance of renewal parts, were alone considered. Although the wattage of the largest incandescent lamp chosen, including the series transformer loss, was 40 per cent greater than for a given arc, its demand upon the sub-

RELATIVE EFFICIENCY OF GLASS A AND GLASS B

Glass	Zone	Lumens	Percentage of Total With Clear Lamp	Mean Candle-power
A	0—60	2040	20.9	650
	0—90	4780	48.9	761
	90—180	1920	19.6	306
	0—180	6700	68.5	533
B	0—60	1820	18.6	580
	0—90	4250	43.5	677
	90—180	2170	22.1	346
	0—180	6420	65.6	511

station capacity was actually less, because of better power-factor, and the annual operating expense was practically the same for both units; in fact, they differed in this respect by less than 1 per cent.

It is true that in going toward the higher wattages such as are common in "white-way" lighting the arc lamp increases in efficiency relatively faster than the incandescent unit, and for this service, therefore, one might expect to find the arc in a relatively better position from the standpoint of economy than in overhead lighting, where units of 200 watts to 300 watts are ordinarily employed. On the other hand, overhead lamps are usually operated on an all-night schedule,



DISTRIBUTION WITH GLASS B—CONTAINING SMALL AMOUNT OF OPAL

whereas, with the exception of those at street intersections, "white-way" standards are commonly extinguished at midnight; consequently in ornamental lighting systems the relative importance of investment charges is doubled and the lower fixed costs on the incandescent units are often just about sufficient to offset

the increased efficiency of the arcs. However, the very fact that fixed charges do have an important bearing upon operating cost and that the percentage of the total which they comprise depends not only upon the first cost of the installation, but also upon the hours of use per night and the rate for energy which obtains in a particular locality, make it quite impossible to formulate any general statement as to the comparative economy of two different systems of street lighting.

In the Cleveland trials it was found that the arc and incandescent lamps which had the same operating cost also showed an approximately equal volume of light on photometric test when equipped with clear glassware. Setting aside these considerations, therefore, the factors which remained, and which influenced the decision in favor of the incandescent system, were desirable distribution of light, simplicity of operation and absence of mechanism, the expectation of improvements in incandescent lamps and reduction in their cost, the practicability of using lamps of candle-power on the same circuit for the illumination of side streets, the adaptability of the system to changes and improvements in the art, and finally the pleasing and distinctive appearance of the unit.

Steel-Reinforced Aluminum Cables

Characteristics of These Compound Conductors—Use in Large Transmission Systems—How to Make Accurate Calculations for Sag and Stress

By E. T. Driver and Ernest V. Pannell

For many years the adoption of aluminum conductors for long-distance transmission lines has been found economical. However, owing to the lower tensile strength of this material, it is impossible to pull up such conductors as tightly as copper. The greater sag on the aluminum cables necessitates higher and more expensive towers, and in some cases the economy resulting from the use of the light metal has been more than counterbalanced by this fact. This has been the main reason for the introduction of steel-center aluminum conductors, and the fact that such composite cables have been in use for more than ten years indicates that this project is now beyond the experimental stage.

Some of the important power undertakings using this type of conductor for long-distance lines are the Pacific Light & Power Company (Big Creek to Los Angeles), the Southern Sierras Power Company (Bishop Creek to San Bernardino), the Cedars Rapids Manufacturing and Power Company (Cedars Rapids, Que., to Massena, N. Y.), the Central Georgia Power Company (Griffen to Atlanta), the Ontario Hydro-Electric Power Commission, the Tennessee Power Company, etc. Special attention may be called to the first two lines mentioned, which represent the most recent developments in transmission engineering and employ an aggregate of about 7,000,000 lb. of steel-aluminum conductors.

Notwithstanding the wide use of this material, very little information has up to the present been published upon its characteristics. Owing to the compound nature of the conductor, it does not possess constant physical properties like an all-aluminum cable. Virtual values may, however, be deduced which correspond with fair accuracy to the properties exhibited by the wires when erected. Of necessity, the values will vary according to the ratio of steel to aluminum in the cross-section of the cable. The simplest form is that in which six aluminum strands are laid up around a central steel wire, all the seven strands being of the same size. This is used for the smallest sizes of cable up to about No. 1 A. W. G. (B. & S.). Larger areas, up to about 225,000 circ. mils, usually have the single steel wire replaced by a seven-wire steel cable of the same area. The ratio of steel to aluminum is the same in both these cases. Cables larger than 225,000 circ. mils are usually of thirty-seven or sixty-one strands (see Table II).

Calculating Sag and Stress

For the accurate calculation of sag and stress in overhead wires it is necessary to know the modulus of elasticity and the coefficient of linear expansion of the material. The elastic limit and the tensile strength are easily averaged from the results of individual tests on the steel and the aluminum. It should be noted that the usual practice when erecting steel-center cables is to bring out and snub off the core at each dead-end clamp, thus developing the full strength of the steel.

Table I gives the values for the constants of the component wires from which the data in Table II were calculated. Different specifications may, of course, call for values varying considerably from the above; but these figures are representative of the greater part of the steel-aluminum cables in use. The constants adopted for aluminum are average values for the material manufactured by the British Aluminium Company.

To determine the modulus of elasticity of the composite cable, consider first a vertically suspended length

TABLE I—VALUES FOR CONSTANTS OF COMPONENT WIRES

Constants	Steel	Aluminum
Modulus of elasticity, lb. sq. in.	30×10^6	9×10^6
Elastic limit, lb. sq. in.	130,000	14,000
Ultimate strength, lb. sq. in.	160,000	24,000
Coefficient of expansion per deg. Fahr.	6.4×10^{-6}	12.8×10^{-6}

of seven-strand cable (six aluminum wires and one steel), with its ends rigidly clamped and a load hung from the lower end.

Let a = cross-section of each wire—then $7a$ is the cross-section of the complete cable;
W = load in lb., total,
W_s = load in lb. on steel,
W_a = load in lb. on aluminum.

Then the elastic extension of the steel under the load is

$$e = \frac{W_s \times L}{a \times 30 \times 10^6}. \qquad (1)$$

But the aluminum must also extend by the same amount, whence

$$e = \frac{W_a \times L}{6a \times 9 \times 10^6}. \qquad (2)$$

Equating these two values of e gives $W_s = 5/9W_a$. But $W_s + W_a = W$, and therefore

$$\left.\begin{aligned} W_a &= 9/14W, \\ W_s &= 5/14W. \end{aligned}\right\} \qquad (3)$$

Under the foregoing assumptions, therefore, the aluminum wires will take 64.28 per cent of the total load, and the steel center the remaining 35.72 per cent. Upon each individual aluminum wire will be a load amounting

to 10.71 per cent of the total, so that, considering unit stresses, the steel is loaded three and one-half times as much as the aluminum.

Let E be the modulus of elasticity, in pounds per square inch of the composite cable as a whole. Then the elastic extension of the cable may also be written

$$e = \frac{W \times L}{7a \times E}.$$

Equating this to (2) and substituting for W_a its value from (3) gives $E = 12 \times 10^6$.

In the same manner the modulus of elasticity of a composite cable made up of any number of wires may be expressed in terms of the moduli of the component wires.

To determine the coefficient of expansion of a composite cable, consider a length of overhead cable erected in the customary manner and let the cable be securely clamped at each insulator. Let the stress in the complete cable be 9800 lb. per sq. in. at 70 deg. Fahr., and let L be the length of the cable. The total tension in the cable will be $9800 \times 7a = 68{,}600a$ lb., of which the aluminum wires take nine-fourteenths, or $44{,}100a$ lb., and the steel five-fourteenths, or $24{,}500a$ lb. The corresponding stresses in the aluminum and steel are 7350 lb. and 24,500 lb. per sq. in. respectively. Let the temperature now rise to 170 deg.; the cable will then experience a thermal increase in length which, by giving rise to a decrease in stress, will cause an elastic diminution in length. Let L_1 be the length of the cable at this upper temperature of 170 deg.; let S_a and S_s be the unit stresses at this temperature in the aluminum and steel respectively, and let S be the average unit stress in the whole cable at this temperature. Then, for the aluminum,

$$L_1 = L + 12.8 \times 10^{-6}(170 - 70)L - \frac{(7350 - S_a)}{9 \times 10^6}L, \quad (4)$$

and for the steel,

$$L_1 = L + 6.4 \times 10^{-6}(170 - 70)L - \left(\frac{24{,}500 - S_s}{30 \times 10^6}\right)L. \quad (5)$$

Let α be the coefficient of linear expansion of the composite cable, then for the complete cable,

$$L_1 = L + \alpha(170 - 70)L - \left(\frac{9800 - S}{12 \times 10^6}\right)L. \quad (6)$$

Equating (4) and (5) gives

$$3S_s - 10S_a = 57{,}600. \quad (7)$$

Similarly, equating (4) and (6) gives

$$4S_a - 3_s = 36 \times 10^6\alpha - 46{,}080. \quad (8)$$

Considering the respective areas of the steel and aluminum,

$$6_a \times S_a + a \times S_s = 7a \times S,$$

or

$$6S_a + S_s = 7S. \quad (9)$$

Combining (7) and (9) gives

$$S_s = 12{,}343 + 2.5S. \quad (10)$$

Substituting this value of S_s in (7) gives

$$7.5S - 10S_a = 20{,}571. \quad (11)$$

Combining (8) and (11) gives

$$\alpha = \frac{189{,}258}{180 \times 10^6} = 10.51 \times 10^{-6}.$$

From the foregoing the coefficient of linear expansion per degree Fahrenheit is 10.51×10^{-6} for a seven-wire cable. The value of this coefficient has also been calculated for other forms of stranding, as tabulated in Table I, and although the values given are subject to modification in certain circumstances, they are found to be sufficiently correct for all practical purposes.

Having thus determined values for E and α it is possible to solve any problem in sag and tension. These variations of sag and stress are most easily studied by means of a Thomas chart* or some similar diagram.

The effects on the sag produced by changes in temperature are of particular interest. For example, consider a 250,000-circ. mil steel-core aluminum cable erected under a total tension of 9800 lb. per sq. in. at 70 deg. Fahr. on an 800-ft. span. The value of the average unit stress at a temperature of 170 deg. Fahr. will then be $S = 6580$ lb. per sq. in., and the total tension, therefore, $7a \times 6580 = 46{,}060 \times a$ lb. Substituting this value in equation (10) gives $S_s = 28{,}793$. Similarly from (7), $S_a = 2878$. The stress in the steel is seen, therefore, to be 28,790 lb. per sq. in., and that in the aluminum 2880 lb. per sq. in., corresponding to tensions of $28{,}790 \times a$ lb., and $2880 \times 6a = 17{,}280 \times a$ lb. As already seen, the respective tensions at 70 deg. Fahr. were: For the whole cable, $68{,}600a$ lb.; for the steel, $24{,}500a$ lb., and for the aluminum, $44{,}100a$ lb. The pull in the steel has therefore been intensified by the increase of temperature, whereas the tension in the aluminum has been reduced by more than 26,000 lb. The net effect of an increase in temperature is, therefore, to reduce the stress in the complete cable, throwing a greater proportion of the strain upon the steel. The effect of a fall in temperature is just the reverse. Briefly, at high temperatures the steel takes nearly all the tension, whereas at lower temperatures the aluminum envelope takes up a greater share of the load.

In Fig. 1 are given curves showing the value of the sag at maximum summer temperature for three kinds of conductors, namely, copper, aluminum and steel-reinforced aluminum. From these curves the height of tower to give the requisite ground clearance may be estimated. The conditions assumed are maximum stresses of 30,000 lb. per sq. in. in the copper and 14,000 lb. per sq. in. in the aluminum, corresponding approximately to the elastic limit or to one-half the ultimate strength in each case. In the case of the steel one-half the ultimate strength has also been assumed as the maximum stress. The cables could be strung with much shorter sags if the elastic limit were taken. Allow-

TABLE II—PROPERTIES OF STEEL-CORE ALUMINUM CABLES

Area, Circular Mils			Stranding			Modulus of Elasticity, Lb. per Sq. In.	Coefficient of Expansion per Deg. Fahr.	Elastic Limit, Lb. per Sq. In.	Ultimate Tensile, Lb. per Sq. In.
Aluminum	Steel	Cable	Aluminum	Steel	Cable				
Up to 225,000	Up to 37,500	Up to 262,500	6	1	7	12×10^6	10.51×10^{-6}	30,600	47,000
225,000 to 350,000	52,500 to 81,670	277,500 to 431,670	30	7	37	13×10^6	10.0×10^{-6}	35,900	53,100
350,000 to 550,000	45,370 to 71,300	395,370 to 621,300	54	7	61	11.4×10^6	10.87×10^{-6}	27,500	43,100

TABLE III—EFFECT OF TEMPERATURE ON THE TENSION IN A 250,000-CIRC. MIL STEEL-CORE ALUMINUM CABLE, 800-FT. SPAN

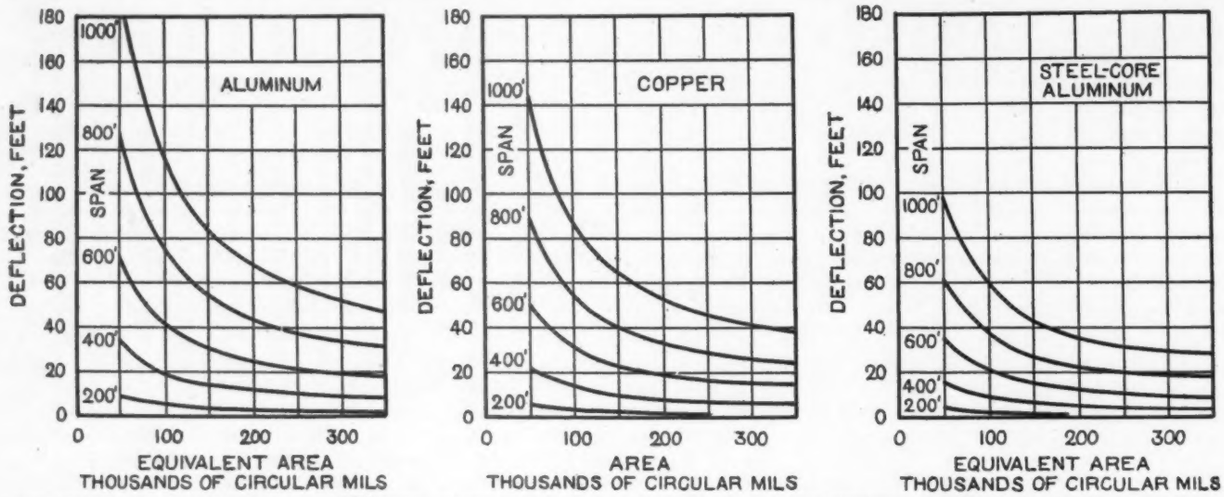
Temperature, Deg. Fahr.	Tension in Pounds		
	Cable	Stee	Aluminum
−20	4260	1210	3050
70	1923	689	1234
170	1293	808	485

*Electrical World, Vol. 60, No. 20.

ance has been made for ½-in. thickness of ice around the conductors and a wind velocity of 70 miles per hour at zero degrees Fahrenheit, these conditions being considered sufficiently severe to cover construction in the Northern States and in Canada. It should be noted that the sags for steel-core aluminum do not lie on a smooth curve, for the modulus of elasticity changes slightly on transition from seven to thirty-seven and to sixty-one-strand cables. For simplicity, and also on account of the small scale, smooth curves have, however, been drawn in.

As may be deduced from the curves, for usual cable sizes and spans the deflection of steel-reinforced conductors is only from 60 to 70 per cent of that occurring with copper. Needless to say, therefore, the towers can be considerably cheapened and an appreciable saving effected in construction cost by the use of steel-core aluminum cables. At present, under the average market conditions, a transmission system employing aluminum conductors is frequently cheaper than the equivalent line erected with copper, notwithstanding the higher cost of the towers in the former case. If the towers can be reduced in cost, the economic advantages are more than ever on the side of aluminum, particularly as the extra cost involved by the steel core is trifling.

The cables erected on the Pacific Light & Power Corporation's lines from Big Creek to Los Angeles, Cal., were strung with a tension of 7500 lb., corresponding to a maximum stress of 14,200 lb. per sq. in., or with a factor of safety of three. It is practicable, therefore, by employing steel-core aluminum cables to use factors of safety higher than the ordinary where extra substantial construction is desired.



DEFLECTIONS IN STILL AIR AT 120 DEG. FAHR. OF EQUIVALENT SIZES OF CONDUCTORS STRUNG TO HAVE A FACTOR OF SAFETY OF TWO AT 0 DEG. FAHR. WITH ICE LOAD ½ IN. THICK AND WIND 70 M..P.H

When steel-reinforced cables were first employed an objection was raised to this type of conductor on the grounds of increased windage and impedance. The area opposed to the wind is, however, only 3 per cent greater than with an all-aluminum cable, allowing for the ice-coating, and the increased impedance is probably no greater than the slightly increased conductance afforded by the steel core. Moreover, with transmission at 100 kv. to 150 kv., every fraction of an inch by which the cable diameter is increased is of value in reducing the effect of corona.

Lighting Charleston, W. Va., with Arc Refractor Units

The residential and outlying portions of Charleston, W. Va., are lighted by 260 luminous-arc lamps equipped with refractor units which especially adapt the distribution of light from these lamps to the conditions of spacing imposed. The lamps are hung at street intersections at heights of from 22 ft. to 25 ft. above the pavement level, an arrangement which results in spacing the lamps at intervals of from 300 ft. to 400 ft. between units.

In the downtown district there are installed sixty-two 4-amp. ornamental-type lamps, also of General Electric manufacture, using high-efficiency electrodes and inclosed in Alba globes. The poles are spaced at intervals of 120 ft. on opposite sides of the street, and the lamps are hung at a uniform height of 16.5 ft. above the curb-line.

The lamps used in the residence section are of the 4-amp. pendent type and are fitted with refractor elements which distribute the light usefully over the surface to be illuminated. The installation has added not a little to the attractiveness of the city.

What the National Bureau of Standards Is Doing

Abstracted from a Paper Prepared for the International Association of Municipal Electricians by Dr. E. B. Rosa, Chief Physicist Bureau of Standards

THE work of the National Bureau of Standards with various public utilities, and the possibilities of extended service in this direction were greater resources provided for the bureau, were discussed in detail by Dr. E. B. Rosa, chief physicist of the Bureau of Standards, Washington, D. C., before the recent convention of the International Association of Municipal Electricians at Cincinnati, Ohio. He referred to the complete electrolysis surveys in St. Louis, Mo., and Springfield, Ohio. At the request of the various utilities of Springfield, Mass., except the railway company, and with the consent and co-operation of that company, such a survey was made in that city and a full report rendered as to the best methods of securing protection from electrolysis damage. Recently a thorough study was undertaken by the bureau of the methods of track bonding and roadbed construction, especially with reference to securing good electrical conduction and permanence in the bonds and as much electrical resistance as possible between rail and earth. Measurements of roadbed resistance are being made at various places on actual railways. The object is to keep the current in the rails and reduce leakage to earth at a minimum of expense, and the street-railway companies are co-operating very cordially with the bureau in this work. A study of the protection of buildings against lightning and the grounding of transformers and service wires to protect persons against the high voltages of distribution and transmission lines has also been undertaken. An extensive discussion of lightning protection is now in press, and a circular on grounding circuits will be prepared shortly.

There are a great many other problems pertaining to street railways, said Dr. Rosa, which might well be investigated, though the bureau has not so far attempted to do so. These have to do with (1) the quality and adequacy of service, (2) the efficiency and cost of service, (3) the safety of service and methods of reducing accidents to employees and the public, and (4) studies of regulation, inspection and administration.

The bureau has also made a thorough study of electric service and collected and studied all the rules and ordinances of State commissions and cities. Three model ordinances have been prepared, one for large cities, one for medium-sized cities, and one for small cities and towns. In the first the requirements are more detailed and the quality of service required is higher than for smaller places. In the third the requirements are fewer and inspections by the city or town are not expected, but the character of service to be expected is specified and there is a basis for further requirements when practicable. In this work also the bureau had the co-operation of electrical companies and State commissions, many valuable criticisms and suggestions having been received after they read the manuscript of the publication, which will be Circular No. 56. The bureau has co-operated for years with the meter committee of the National Electric Light Association, and one of the important subjects of the new circular is meter testing and meter accuracy. At the invitation of public service commissions, representatives of the bureau have attended a considerable number of hearings in various States where proposed rules for the regulation of gas or electric service were under discussion, and have given commissions assistance in formulating such rules. In every case the bureau seeks, while representing the public interest, to get also the utility's point of view, and has always consulted the utility's management before publishing any proposals or suggestions as to rules or regulations.

DR. E. B. ROSA

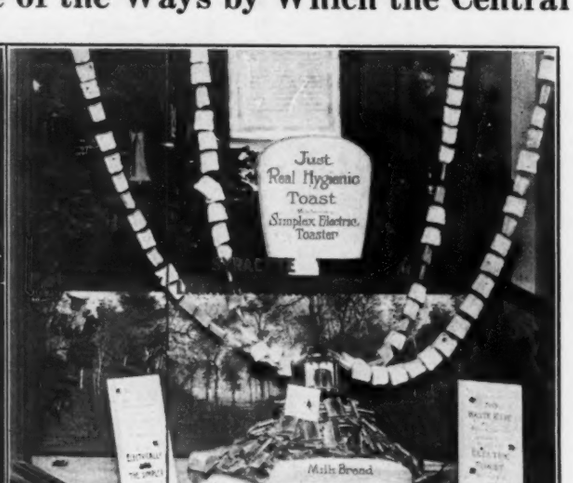
The first case under an arrangement by which the bureau co-operates with the Underwriters' Laboratories by hearing appeals in certain cases where clients are not satisfied with the ruling of the laboratories was one concerning renewable cartridge fuses. This is now being studied.

Even where there are well-equipped and active State commissions which have adopted rules and are ready to hear complaints regarding rates or service, a very large responsibility rests upon the municipalities. Obviously, Dr. Rosa added, it will never be practicable for any State commission or city to handle these questions alone. One method of doing it is for the State and cities to get together and establish a special bureau or institution for the purpose, and this may be the best way, the several States or cities paying for any service derived from the bureau. The new Utilities Bureau of Philadelphia is such an institution, and there is an ample field for its activities, Dr. Rosa declared. But for a certain portion of the work to be done it has appeared very desirable for a bureau of the federal government to assist, and this is why the Bureau of Standards has been doing, in a somewhat experimental way, what it has to test the feasibility of the method.

The Bureau of Standards receives about $500,000 a year for all its activities. The sum available for the public utility work, including a special appropriation for the safety work, is $40,000 per year, and, allowing for the supervision and assistance rendered from the general fund, it may be considered as $50,000 per year. Many of the States spend more than this, and some States five or ten times as much. The people of the United States spend about $2,000,000,000 a year for the service of public utilities, including telephone, gas, electric light and power, electric-railway transportation and miscellaneous utilities, not including steam railways. A federal bureau well equipped with men and apparatus and permitted to work in the very wide field of public utilities (outside of railroad transportation and such subjects as the Interstate Commerce Commission is concerned with) could do a wonderful work. Would 1 cent a year per capita, Dr. Rosa asked, be too much for the people to spend through the federal government to accomplish the desired result? At present the Bureau of Standards is spending one-twentieth of this and has accomplished enough to show how valuable such work is.

SHOW WINDOWS—One of the Ways by Which the Central

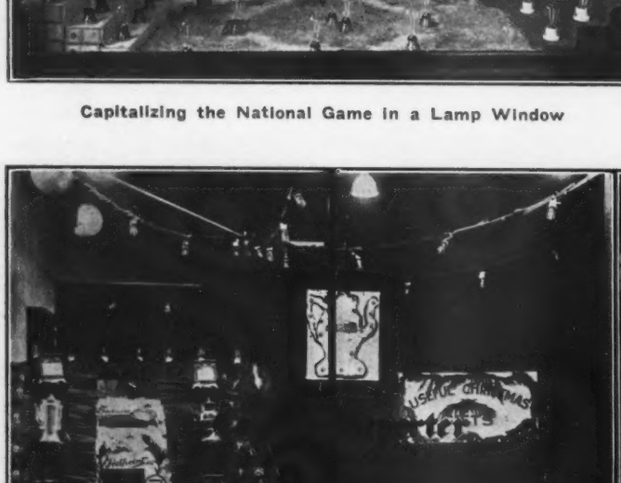
A Labor-Saving Exhibit for Labor-Day Display



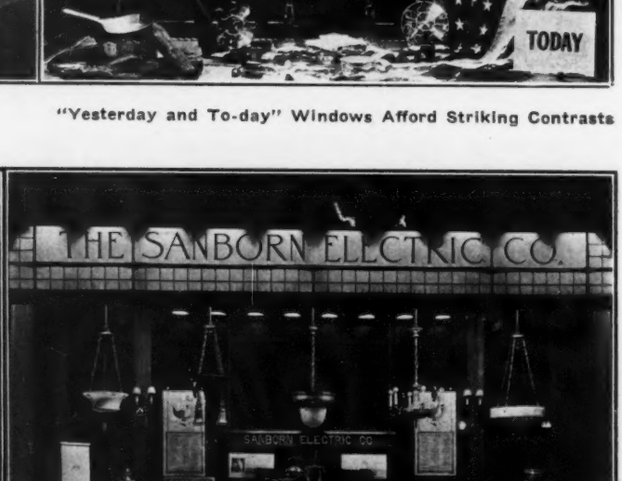
Electric Toast Always Appeals to the Appetite

Capitalizing the National Game in a Lamp Window

"Yesterday and To-day" Windows Afford Striking Contrasts

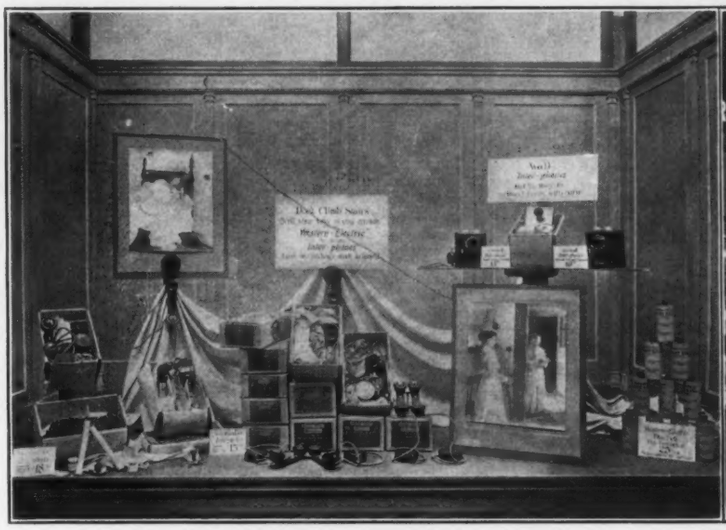


Utilizing a Rented Window on a Busy Street



Dealers Should Not Overlook the Electric-Cooking Opportunity

Station and the Electrical Dealer Can Reach the Buying Public



Household Electric Conveniences That the Dealer Can Install

An Attractive Summer-Time Fan Display

The Automobilist Is One of the Dealer's Best Patrons

An Inviting Interior Is Often the Best Window Display

Window Cards and Plain-Figure Prices Secure the Customer's Confidence

A Live-Figure Exhibit Holds Attention

Part Construction Plays in Getting Small Loads

Distribution Arrangements That Are Inexpensive Yet Serviceable Can Be Quickly Made and Easily Replaced

THE problem of finding some relatively inexpensive form of construction that can be used in reaching small customers has been solved in several ways. In locations where the outlook for future business is not of the brightest and in places where pole lines cannot be constructed the Edison Electric Illuminating Company of Boston uses split-fiber ducts

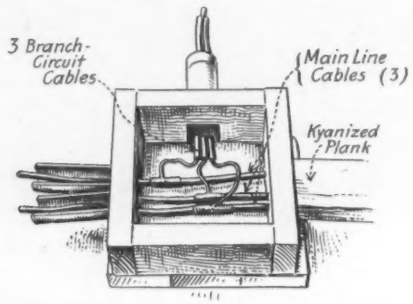


FIG. 1—THREE-WIRE LOW-TENSION SPLIT-DUCT SYSTEM

filled with melted coal-tar paving pitch. The details of this construction for a three-wire low-tension system are shown in Fig. 1.

Boston Edison Company's Split-Duct System

A trench about 2.5 ft. to 3 ft. deep is dug, and at the bottom two 2-in. fiber pipes with slots cut along the top for inserting the conductors are laid side by side. These slotted ducts are connected by collars similarly cut along the top. After each of the outside conductors, which are ordinary weatherproof wires, are placed in the fiber pipe the latter is filled with melted coal-tar paving pitch, which on solidifying forms a waterproof covering. The neutral conductor, also a weatherproof wire, is laid in the dirt between the ducts. Two-inch Kyanized spruce planks are then laid over the pipes to protect them from disturbance during any subsequent excavation, and the trench is back-filled with earth.

Service connections are made in 12-in. by 12-in. by 6-in. Kyanized wood boxes similar to the one shown in the illustration and built in the main. Two-and-one-half-inch fiber pipe is used for branch lines, and standard rubber and lead-sheathed cables are used for service connections. After connections have been made between the main and branch lines, the box is filled with pitch, a plank cover being placed over it for protection and covered with earth in the same way as the conduits.

The chief advantages of this system, according to H. W. Stevens of the Boston company, are that additional branch circuits can be easily connected at any time by installing similar junction boxes, and the use of wiped cable joints, manholes and concrete is eliminated. The construction is also cheaper than for any other type of underground construction, yet more expensive than overhead lines. An experimental installation made several years ago has never given trouble of any kind, and its extended use by the Boston company is now favorably considered in cases where economical construction is required.

An Underground-Overhead Distribution System at Davenport, Iowa

Although all of the circuits of the People's Light Company at Davenport, Iowa, are laid underground in some forty blocks of the downtown district, none of the transformers have been placed in manholes. The business district of the city is thus served through an unusual arrangement, which is a combination underground-overhead system. The reason for selecting this

FIG. 2—TRANSFORMER MOUNTING FOR HOTEL SERVICE

FIG. 3—POLE STUB USED FOR TRANSFORMER PLATFORM

FIG. 4—TRANSFORMER PLATFORM ON A CUSTOMER'S SERVICE POLE

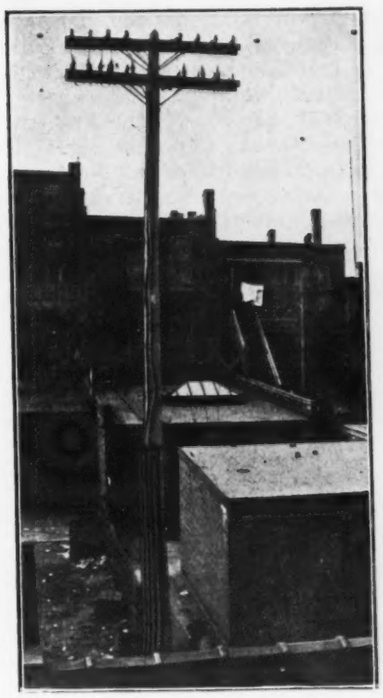


FIG. 5—DISTRIBUTION CENTER FOR BUILDINGS OF SEMI-PERMANENT TYPE

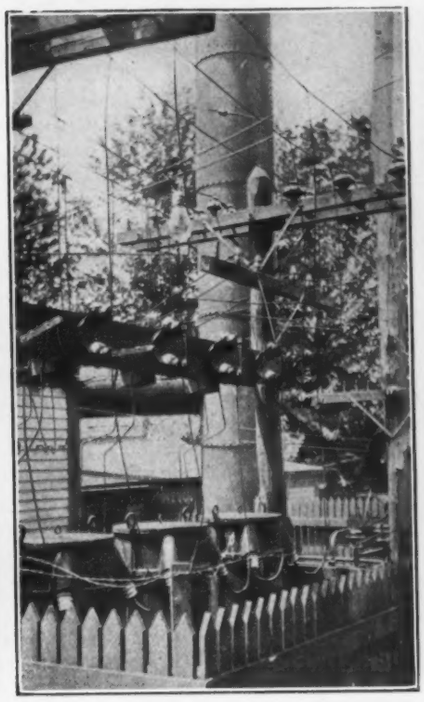


FIG. 6—TRANSFORMER AND SWITCHING ARRANGEMENTS AT AYER, MASS.

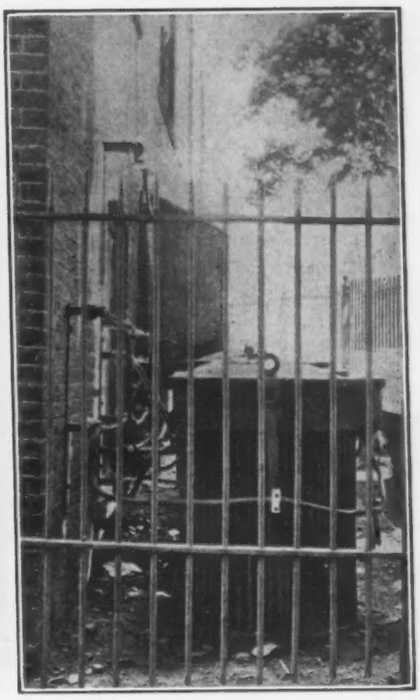


FIG. 7—TRANSFORMERS SET IN A FACTORY YARD FOR WANT OF A BETTER PLACE

type of distribution system, as stated by Mr. H. C. Blackwell, vice-president of the company, was twofold: First, an increased rate of transformer radiation and hence greater transformer rating was secured by placing the transformer in the open. The arrangements in Figs. 3 and 4 also permit the connecting of special and temporary loads quickly. The system has the further advantage of allowing the use of small manholes, the average size employed being 5 ft. wide by 7 ft. long by 7 ft. deep.

Three installations which are typical of the transformer mountings in the downtown district of Davenport are shown in Figs. 2, 3 and 4. A heavy bank of units serving a newly constructed hotel is shown in Fig. 2. The risers from the 2300-volt mains laid in the alley and the secondaries returning by way of the basement to the hotel's distributing switchboard are shown beneath the platform. Fig. 3 illustrates one of the methods used when mounting a single transformer on an elevated platform 14 ft. above the ground. Here the primary and secondary leads are brought up in iron pipe and connected to the transformer through G. & W. potheads. Fig. 4 shows a similar installation with the transformer removed and the connections closed by means of the pothead switches. This platform is mounted on a pole behind the Elks' Club, which on special occasions uses energy in large quantities for decorative lighting. At such times an extra transformer is temporarily connected to the secondary system from this platform, where it has the advantage of being near the point of extra load. The platform will eventually be the site of a permanent transformer when the load grows as expected in this part of the city.

According to the plan on which the system was laid out, circuits were run in conduit in each of the alleys for the full length of the underground district. The alternating-current motor circuits were then connected by four two-phase cross-town tie lines operating at 440 volts. Besides the 440-volt, two-phase motor-service circuits the conduits carry 500-volt and 250-volt direct-current circuits, 2300-volt primary circuits, 220/110-volt alternating-current lighting and motor-service circuits, and a bare stranded-copper ground wire. The lead sheaths of all of these conductors are grounded to this bare copper lead. As another measure of precaution the cables from the company's main substation to the first manhole have been placed in a tunnel large enough to admit workmen. At the manhole a fire wall has been constructed in the tunnel entrance to prevent the spreading of a possible fire.

On the customers' premises the company has adopted the policy of running underground services to permanent structures only. In districts where the buildings are small and are likely to be replaced in the near future poles neatly painted and provided with steps are set on the customers' property and used as distribution centers. One such pole is shown in Fig. 5.

In a case where a building extends back so close to its alley that it is impossible to set a pole, the distribution lines are carried from the iron pipe risers to the point of entrance on the outside walls of the structure. Either lead-covered cables or weatherproof-insulated conductors on brackets and insulators are selected for these services. In this way small consumers and customers in buildings of less permanent types are spared the high expense of installing services underground.

Inexpensive Arrangement for Serving Small Loads at Ayer, Mass.

An example of inexpensive yet serviceable arrangements for serving small loads from a modern transmission system is shown in the accompanying illustration of the transformer substation of the Ayer (Mass.) Electric Light Company. Ayer is a railroad junction town of about 3500 inhabitants, and energy for local distribution is purchased by the company from the Connecticut River Transmission Company, which supplies the adjacent city of Clinton from a 66,000-volt transmission system and group of hydroelectric plants in the Connecticut and Deerfield valleys. From Clinton

a number of communities within a radius of 15 or 20 miles are served by 13,000-volt lines. One of these is brought into Ayer and terminates at an outdoor substation containing three 50-kva. oil-cooled transformers, with electrolytic lightning arresters mounted within an inclosure, as shown in the accompanying illustration.

The terminal pole for the 13,000-volt line and inexpensive pole structures for mounting disconnecting switches are constructed in an area of about 12 ft. by 20 ft. just outside the local steam plant, which is held in reserve. The high-voltage lines are run on one side of the pole structure and the 2300-volt connections from the transformers to a switchboard within the steam-plant building are installed on the other. The transformers are mounted on a concrete base about 2 ft. above the lightning-arrester tanks. The local service includes a 15-hp. variable-speed induction motor driving a railroad turntable, as well as a number of motors in the local repair shops and garages.

In one of the factory power installations of another Massachusetts town an unusual but convenient location for transformers was found in a corner of a yard between the building line and two intersecting sidewalks. On account of the shape of the property this space was of little value for other use. As shown in Fig. 7, the power leads are run from the transformers into the building through a condulet and conduit, furnishing protection against moisture, the leads being supported on insulators with pins fastened to the wall by 1-in. by 0.25-in. strap iron. The 2300-volt leads to the transformers are brought upward from the central-station conduit system under the switch box, and the installation is both compact and inexpensive.

While the accompanying illustrations do not show a high regard for permanency of design, they do indicate the possibilities of economical distribution from an investment standpoint in the territory crossed by a transmission system.

Station and Operating Practice

A Department in Which Are Described Methods and Equipment for the Economical Generation and Distribution of Electrical Energy for All Uses

Curves Showing Steam-Station Performance

What These Data Show and How They Can Be Used in the Improvement of Plant Efficiency

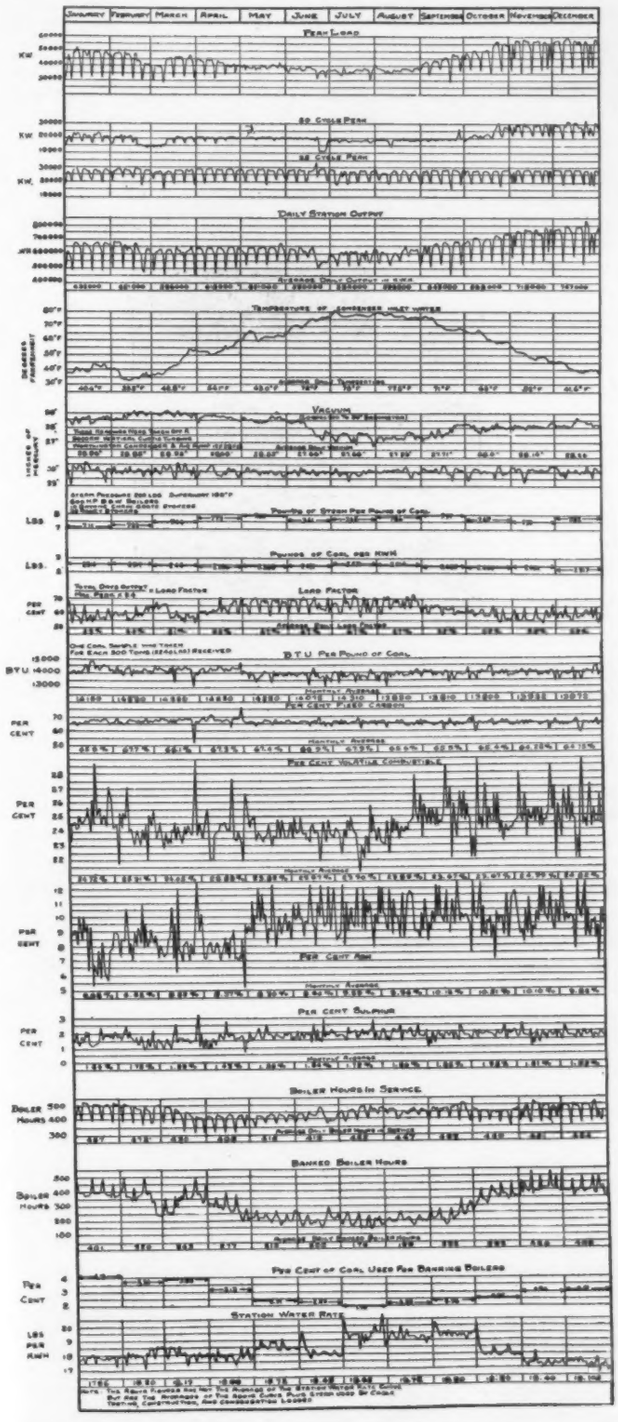
MOST engineers operating steam stations recognize that some check should be kept on the performance of equipment. Often, however, the records that are prepared cannot be used to full advantage, and they are usually filed with only a hasty examination. Operating data when converted into curves plotted to the same time scale and arranged one above the other show plant conditions in a most comprehensive way. Such a collection of curves is shown herewith and represents the performance of equipment in a large central-station steam plant. The other data that might be included in order to make the collection more complete are the B.t.u. per kilowatt of output, steam pressure, temperature of steam, temperature of boiler feed, temperature of flue gases, engine-hours in service, main-unit water rate, and auxiliary water rate. Practically all of the curves shown can be plotted from the daily records ordinarily kept and added to each day or month to give ready comparison of results of continuous performance.

In general, curves of this sort show when and where improvements have been or should be made in order to decrease the cost of producing electrical energy. The combined peak-load curve shows primarily the margin between the peak loads and the ratings of the apparatus. It may also be employed in estimating the probable extent of future peaks, the time of their occurrence, and the amount of steam generating equipment that must be kept in readiness for operation. The daily station output curve may be used as a basis for studying other curves, such as daily load-factor, engine-hours in service, boiler-hours in service, banked-boiler-hours, water rate, and the like. From the curve showing condenser performance it is possible to tell when dirty water is seriously affecting its operations and how the flow of cooling water should be changed at the different times of the year to compensate for changes in temperature as far as possible. By comparing the daily load-factors with the peak load-factors it is possible to tell whether the load should be carried continuously by machines rated close to the peak-load or by lower-rated generators assisted or supplemented during the peak by other machines. A comparison of the pounds of steam per pound of coal burned with the analysis of the coal gives an idea whether the evaporation is what it should be, and also indicates what coal consumption should be expected under similar conditions. Similarly a study of the pounds of coal per kilowatt-hour is a measure of the over-all efficiency of the plant. The boiler feed-water data shows further when feed water is handled properly to maintain the maximum benefit from the exhaust steam discharged by the auxiliaries. Flue-gas temperatures indicate whether the baffling of boilers has been maintained properly and when the flues need cleaning. The percentage of ash in the fuel gives some idea of the expense of cleaning the grates and removing the ashes, and thus indicates the amount that should be charged to fuel expense. The curves of boiler-hours in service and banked-boiler-hours are of use in determining the amount of work done by each individual unit. The amount of coal used in banking boilers should be determined by actual test at different times of the year.

The station water-rate curve may be plotted from data showing the amount of feed water supplied to the boiler to maintain a constant level. In most cases it is advisable to subdivide this data into two curves, one showing the main-unit water rate and the other showing the auxiliary water rate. The necessary data can be secured by measuring the condensed steam from the main units and auxiliaries. Leaks in the steam mains, excessive blowing down of boilers and losses of steam through "popping" of the safety valves will be indicated by a difference between the station water rate and the sum of the main unit and auxiliary water rates. De-

creased efficiency of the prime movers and auxiliaries will be shown by increases in their respective water rates. For these reasons it will be found profitable to give the water rates the closest study of all station data.

The operating engineer of a steam plant is an important factor in the economical performance of station equipment. He should be in a position to show not only what he has done and where, but also what he should do and why. This is exactly what the accompanying curves will help him to do, and when successful the accomplishment will incidentally make him a manager.



THESE CURVES BY THEMSELVES SHOW OPERATING CONDITIONS AND RESULTS; THE ARRANGEMENT INDICATES WHEN AND WHERE IMPROVEMENTS WILL REDUCE OPERATING COSTS

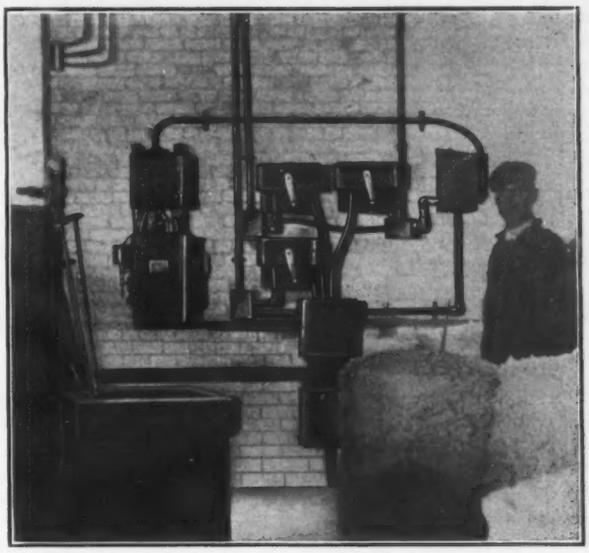


FIG. 1—MOTOR STARTERS AND OIL SWITCHES INSTALLED ON WALL IN ONE PLACE

OPERATING FACTORY MOTORS

How a Motor-Starting Problem in a Massachusetts Cotton Mill Was Solved at Small Cost

BY S. P. GOODALE

The illustrations herewith show an arrangement of motor-starting apparatus in a Massachusetts cotton mill where 10-hp. motors were used to drive breaker pickers, the motors being belted to countershafts supported on the driven machines.

In the original layout the oil switches were mounted in a group on the wall of the room and used to start and stop the motors. On account of the inertia of the parts to be started and the suddenness with which the motors attained full speed when the switches were closed, it was practically impossible to prevent the belts from coming off the pulleys at starting. The machine tenders formed the habit, which is common in such cases, of throwing the switches in and out quickly a number of times in order to start the motors with as little shock as possible. While this resulted in starting the motors fairly well, it was hard on the switches. While the effect on the line voltage was also bad, this was not noticeable to the operator since energy was purchased and the mill did not operate lights on the same circuits. Later the use of purchased energy was discontinued and the motors were driven from a generator used also for lighting service. The flickering of the lights when the motors were started was found to be very disagreeable and was a strong inducement in remedying the situation.

The first plan considered was the installation of separate starting compensators, and the following method (shown in the diagram Fig. 2) was finally chosen on account of its lower first cost. A single starting compensator was installed large enough to start the required number of motors one after the other. It was considered that the heating effect on the compensator coils due to starting several motors in succession would be about equal to that of starting one motor of their combined capacity. The compensator selected was the nearest commercial size but its rating was slightly less than the combined ratings of the motors in question. The oil switches used with the motors were retained without change in position or connection, except that taps were taken off at a point between the switches and the motors and run to sets of plug-switch receptacles.

as shown in Fig. 2. The line connections to the compensator were made in the usual way and the motor leads carried to one side of the plug-switch receptacles. The compensator thus formed a by-pass around the oil switches and could be connected to any motor by means of the plug switch.

With this arrangement the machine tender puts the plug in the receptacle corresponding to the motor which he desires to start and in this way connects the motor to the compensator. He then throws the compensator handle in starting position and holds it there until the motor reaches speed, and then pulls it over to the running position. While still holding the compensator handle, he closes the oil switch of the particular motor started. When he releases the compensator handle it returns to the off position automatically, since the low-voltage-release coils are not connected. When all the motors are started in this manner the starting receptacle plug is withdrawn and left out.

The apparatus is so arranged that the machine tender can reach the oil switches but not the plug switch when standing at the compensator, thus allowing the oil switch to be closed before the circuit through the compensator is broken. The plug switch, being out of reach from the compensator, cannot be used as a circuit-making or circuit-breaking device under load, a use for which it is unsuited.

A point of interest in the arrangement described lies in the use of the plug switch, which possesses advantages over the double-throw knife switches that might have been used in that no live parts are exposed and the arrangement is simpler, requiring less space and being less liable to improper manipulation. The use of double-throw oil switches in connection with the single compensator was not made for the reason that such an arrangement would have been more expensive and less serviceable than separate starting compensators.

As shown in Fig. 2, the taps from the motor wires were connected to the inner contacts of the plug receptacles for the reason that these contacts would be alive whenever the motors were running. The outer contacts, which are connected to the leads from the compensator, are only alive when the compensator is being used, at which time, as a result of the design, the contacts are out of reach of the attendant.

There is no possible danger of incorrect manipulation of the switches in this installation that did not exist originally. Since only one plug switch is provided for the several sets of receptacles, only one motor can be started at a time, which is a desirable feature. There is no chance for interference or cross-connection between the motors. Each motor can be started or stopped without reference to any other, and the arrangement is equally adaptable to any number of motors that can be conveniently controlled from one point.

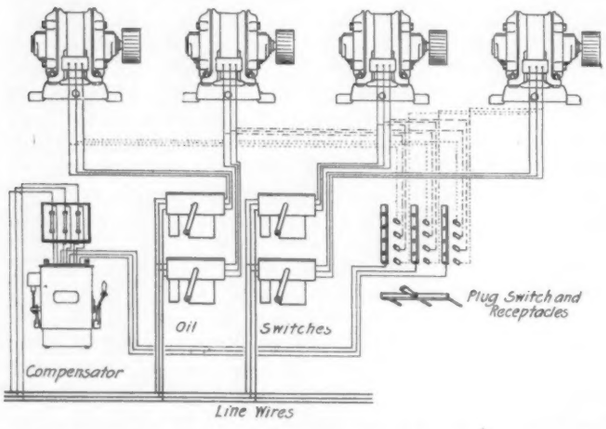
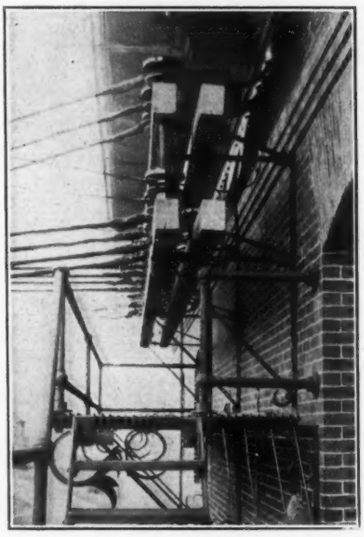


FIG. 2—CIRCUITS FOR MOTOR-STARTING ARRANGEMENTS

Several months' use of the apparatus has resulted in complete satisfaction and no trouble. The arrangement described is not advocated in preference to individual compensators except in cases where oil switches have been installed and found not fully satisfactory and where it is important to keep the cost of a change as low as possible.

A Station Line Outlet and Inspection Platform

The accompanying illustration shows a well-planned outlet structure at the Saccarappa generating station of the Presumpscott Electric Company, Westbrook, Me. All outgoing leads are carried from lighting arresters



LINE OUTLET 40 FT. OVER TAILRACE MADE ACCESSIBLE

in a compartment above the operating room through the usual wall bushings. The latter are of the elbow type, turned downward below the eaves to keep out moisture. The leads from the bushings are carried to insulators on a double cross-arm structure supported on 2-in. by 0.75-in. iron brackets. The bushings are 2.5 in. in diameter and the cross-arms are connected vertically by 1.5-in. pipe. The arms are 4 in. by 6 in. in section and mounted about 30 in. above a grating platform with guard rail, which is about 40 ft. high, over the tailrace. The platform is reached through a 3.5-ft. by 3-ft. window in the lightning-arrester compartment and a short flight of stairs as shown. The platform is 4 ft. wide and provides an excellent means of inspecting and repairing a portion of the plant equipment often left without adequate access.

A Motor-Operated Centrifugal-Blower Trouble

One of the operating characteristics of a centrifugal pump is the rapidity with which its output varies with speed changes. One of the peculiarities of a motor-operated centrifugal pump is the division of the load when discharging into the same header. If the discharge pipe of a reciprocating air pump is plugged, the driving motor is liable to injury unless a safety device acts promptly. If the discharge pipe of a centrifugal pump is plugged, on the other hand, the load on the motor will be reduced to practically nothing.

In one case an operator had two motor-driven centrifugal blowers which operated on the same system but

were not required to operate together. The two outfits were supposedly duplicates and the motors were of the shunt-wound, interpole, field-control type. One of them could be smoothly accelerated up to maximum speed, but the other would cause a fuse to blow whenever the field-control resistance was increased beyond a certain value. The motors were checked with instruments and found to be practically similar in all respects. The starting boxes and the two sets of wiring were interchanged in order to check them, and they proved to be all right. Both the intake and the discharge of the units were plugged, one at a time, so that the fans had no work to do, and under this condition the two motors took practically equal currents and operated at practically the same speed. The absolutely final check would have been to interchange the two motors in order to ascertain if the trouble remained with the same motor, but this procedure would have taken too much time and labor.

Since the characteristics of the air flow could not well be investigated and as not much of a brush shift was required, the overloading tendency of the motor was overcome by shifting its brushes slightly forward.

Saving Steps for the Fireman

At the West Springfield (Mass.) shops of the Boston & Albany Railroad a chimney 155 ft. high is connected with the boiler flue breeching at the generating station. To enable the firemen to watch the smoke conditions at the top of the stack without moving out of their places in the firing aisle, a mirror has been mounted on a post in the yard just outside the boiler house and in line with the aisle. The mirror is 24 in. long and 18 in. wide, hinged at the top, and set at an angle of about 40 deg. from the horizontal, as shown in the accompanying illustration. It is braced against a 5-in. by 8-in. post with ¼-in. by ½-in. iron straps. The presence or absence of smoke can be ascertained from the further end of the fire room, about 60 ft. distant, when standing in front of the furnaces.

A MIRROR ARRANGED TO SHOW WHEN A CHIMNEY SMOKES

Effect of Voltage Changes on Electrical Apparatus

The effects on existing apparatus when the voltage of a distribution system is raised or lowered were outlined in the recommendation of a committee of the Ohio Electric Light Association, urging members to bring lighting voltages within the range of 110 volts to 120 volts, and concentrating within this range on three centers, namely, 110, 115 and 120 volts. It was the opinion of this committee that a plant will meet with little difficulty in raising its operating voltage a few volts, and under favorable conditions as much as 10 volts. The general effects of increasing or decreasing the voltage on existing apparatus are shown in the accompanying tabulation.

The wide range in lighting voltages found at the present time is due to the former inability of incandescent-lamp manufacturers to produce accurately lamps of any single certain voltage. This condition should now be overcome since lamp manufacturers are now able to make lamps of any predetermined voltage, and on account of the fact that if commercial demands for lamps can be confined to only a few voltages instead of many widely different ratings, central stations can themselves bring about an operating economy by helping to reduce the cost of lamp production.

EFFECT ON APPARATUS WHEN CHANGING FROM ONE LAMP VOLTAGE TO ANOTHER, AND POINTS TO INVESTIGATE

Effect of Increased Voltage On:	Effect of Decreased Voltage On:
Generators:	Generators:
Increase in excitation.	Decrease in excitation.
Will the exciter voltage be sufficient to produce the required excitation at full load, or at partial load of low power-factor?	Is the resistance of the field rheostat sufficient to maintain the lower voltage at no load?
Will the fields overheat at the increased excitation required?	Decrease in core loss.
Increase in core loss.	
Will the iron overheat?	Increase in armature copper loss for the same kva. output.
Decrease in armature copper loss for same kva. output.	Will this be offset by the reduction in field and core losses?
Will this offset the additional field and core loss?	
Lines:	Lines:
Increase in transmission radius for the same kva. output.	Decrease in transmission radius for the same kva. output.
Transformers:	Transformers:
For the same kva. output, increase in core losses, decrease in copper losses, somewhat lower all-day efficiency.	For the same kva. output, decrease in core losses, increase in copper losses, somewhat higher all-day efficiency.
Meters:	Meters:
Effect negligible.	Effect negligible.
Lamps:	Lamps:
No effect after the new voltage lamps are installed.	No effect after the new voltage lamps are installed.
Motors:	Motors:
Reduced slip.	Increased slip.
Increased torque.	Decreased torque.
Increased efficiency.	Decreased efficiency.
Decreased power-factor of induction motors.	Increased power-factor of induction motors.

A Way to Remove Dents from Copper Floats

Dents in large copper floats may be smoothed out by cleaning the surface of the depression carefully with acid and then soldering the end of a stick of solder to the spot. By gently pulling on the stick the float may be forced to resume its original shape, when the stick can be removed and the surface scraped clean of any solder that may adhere to it.

Marketing Electricity

A Department on Selling Service and Widening the Use of Electrical Energy

A Word to Managers About Their Men

The Gentle Art of Harmonizing Employees to Get the Maximum of Enthusiasm and Production—The Human Element in Sales Work

By William Gould*

THE most important part of our business to-day is the getting of good results, but in the writer's opinion the average manager is wont to spend too much time looking for results while not giving enough attention to the means of getting them. The salesman is the most important factor with which we have to deal, for he can make results plus or minus, no matter what the selling scheme or the material involved may be. It is, therefore, necessary properly to handle the salesman first, before he can be allowed to handle the selling proposition.

The factors in the selling proposition are constant. The factors in the salesman, however, are widely variable, and if we were so lucky as to have an "enthusometer" to connect up to our salesman, we should very readily see that the "voltage" of his producing power does not show a very steady line.

The human element governs the selling powers of a man, and the author has a few suggestions to make whereby the potential of a man's enthusiasm will remain more nearly constant and at a higher pitch.

Management Governs Output

In 95 per cent of cases it is the manner and method in which the salesman is managed that governs his producing power. This is a statement based on actual figures covering a large number of men. The fundamental start toward getting good results from any salesman is to discover his natural atttiude, not only in regard to life and work, but toward his manager and toward the organization as a whole. Analyze the human impulses which dominate your man. These impulses are the same as yours and mine. Just study him a bit —then treat your salesman in a fair and square way and develop him.

I have heard some people say, "Is it really necessary to have kindergartens for the sales force, treating them as children?" My answer to this is that kindergartening isn't necessary, but that, no matter how old the child is, it helps him if consideration is shown for his ambitions and feelings. If we stop to think a minute, we shall realize that we are demanding just this thing from our superiors. Are we, then, not short-sighted if we think it unfair of our salesmen to demand it of us also?

Much of the supervision that employees receive to-day is of a negative character. Sharp criticism comes more quickly than commendation. The excuse is, "When we pay him his salary to do the work, why should we congratulate him on achieving something he is expected to do?" But anybody who is short-sighted enough to hold this opinion is thinking only from one side, for, granting that your employee is paid enough (which I am inclined to doubt) and that it is not necessary to commend him because of his work, have you ever thought of the possibility of getting, by stimulation, more out of him than he is paid to do? Try it. It costs nothing.

It has been argued that employees treated by this method will become conceited and apt to think that they are doing better than they are. In my experience, less than 5 per cent of those so treated get "swelled heads," and a "swelled head" is quite easily reduced by a poultice of common sense and heart-to-heart talk mixed freely with the understanding that the manager wishes to help rather than criticise. In school and college, the study that most boys are most proficient in will usually be found to be taught by the instructor that they like best. A manager who is not only kind and considerate of the feelings of his subordinates, but who proves to them by actions and words alike that he is eager to help them on, will get 100 per cent better results from salesmen than the manager who feels that the salesman is paid his salary to "deliver the goods," and that that should be the end of it. There's a lesson for all of us in this!

The Influence of Harmony Meetings

Regular harmony meetings of salesmen are one of the first steps necessary toward getting good results. I do not mean an uninteresting meeting, nor do I mean a meeting that is dominated by the manager alone. A manager must sink his individual feelings as to how a meeting should be run and take into consideration how the salesmen want it done. Working on this basis means that every salesman will look forward to the meetings and not attend them just from sense of duty rather than from pleasure. Such meetings can be put into the hands of the employees, and be better managed, if there is some regular organization called, for instance, the "Boosters' Club" or the "Service Club," or some such name, chosen by the employees themselves. Suggestions from employees should be the leading spirit of the enterprise. No matter how poor the suggestion, it should be discussed—no matter how ridiculous it may appear to the manager and some of the men. The only way that either you or I have learned to offer good suggestions has been through experience in offering "fool" ones, and I am not stretching my imagination when I say that managers still make such "fool" suggestions to their own superiors, and therefore should not laugh at some seemingly foolish ideas that come from the employee. The outside man is in closer touch with the public than the inside man. Suggestions coming from the outside men are often worth more in regard to a selling proposition than the opinions of the man who spends his time indoors.

These service club meetings should be to all intents and purposes social as well as business gatherings, and, aside from the discussions which take place on selling

*Commercial manager Gas & Electric Improvement Company, Boston, Mass.

propositions, the get-together spirit is the most powerful spur to interest and loyalty. When I say "Start interest and loyalty," I use the phrase advisedly, because the job is no more nearly completed after the start is made than is a journey finished when begun. Here is where so many managers fall down, because they neglect to pay the same attention to the project after the start has been well made. The stimulation and encouragement of salesman and employee should be a constant source of interest to the manager.

There are three things which we should consider necessary to the success of any employee—his environment, the experience he is getting out of his work, and his salary. To get the best results we should make the surroundings of our men pleasant, associating them with a congenial class of co-workers and giving them a good opportunity to learn more, and with that knowledge win a better salary. Some men will work for a smaller salary when their surroundings are agreeable or when they are gaining valuable experience. This is a point for managers to think about, especially those who pay small salaries. But far be it from me to suggest the inane method of paying salesmen poorly, for the reader well knows that it will eventually bring a lack of interest and a "don't care" spirit, and ultimately cause the men to look for other situations. Nevertheless, it is just as necessary to the ultimate success of any employee to have the right kind of environment and to have the chance to obtain valuable experience as it is that he shall be adequately compensated. It is not good business to let a good man be snapped up by someone else merely in order to save a few dollars a year.

Consider the effect that such a man's experience must have on all the rest of your employees. It brings a drop in loyalty and interest, for each man feels that ultimately he will be forced to look elsewhere for opportunity. Money-loving employers should realize that appreciation costs no money and that it tends to hold good men.

The Power of Hope and Pride

Salesmen come to be buoyed with the hope and desire and confidence that they are going to succeed. That is the first instinct of the human being, and the man is more anxious than his manager for ultimate success. He is eager to know occasionally how he is standing in the eyes of his superior and whether he is "getting on." Does the average manager often think of telling him exactly how he stands? There is no doubt in my mind that most men do not actually know how they are standing with the "boss," and when they do, it is often told them in such a manner as to discourage rather than to encourage them. Finding fault does not set a man right as to how he stands. Finding fault is a negative influence,

THE SERVICE BOOKLETS ISSUED BY MR. GOULD'S COMPANY HAVE PROVED THEMSELVES A VALUABLE MEANS OF KEEPING IN TOUCH WITH THE STAFF

and even while the manager may suggest constructive ideas to take the place of the salesman's enumerated faults, the manager will lose the man's interest and enthusiasm often by the way in which the criticisms have been brought to his attention. "Hammer and tongs" are sometimes necessary, but it is bad to let a fellow-worker leave you with the bitter sting of the hammer and tongs still in his system.

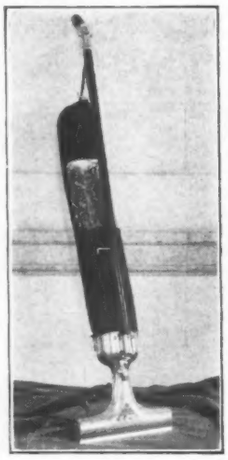
I know of no better method of arousing the competitive spirit among employees than by having charts maintained to show the efforts of every individual in the organization. I would even go so far, if possible, as to show the number of letters written by the stenographers, keeping track, also, of the individual work of office boys and filing clerks, not so much with the idea of making them do good work as to show them that you are interested in their efforts, and to instill the competitive spirit among all hands. If John Smith sees that Henry Brown is beating him in the day's sales, Smith's next day's sales will be made to equal Brown's record or better it, and the more the records are published in the organization, the greater will be the friendly rivalry and results obtained. This not only makes the slow man raise his speed, but it increases the speed of the faster man, in order that he may remain ahead. Few managers have any idea how such records

will stimulate the interest and effort of the salesmen, although to be sustained the plan needs some tangible prize to be striven for, not necessarily a prize in money, but perhaps a day off, an extra week's vacation, or some other token of appreciation. Many times the simple method of offering a first-prize ribbon button to be worn by the winner for the month has brought about desired results.

There is no panacea, but there is this general rule that has held good. Treat your men as individuals, human ones, just like yourself, and see how much you can instill the family spirit and the eager mutuality of a well-trained team, where the captain is the leader in the hard work.

Demonstrating with a "Window" in the Vacuum-Cleaner Bag

A novel demonstration of the power and capacity of an electric suction sweeper has been recently on exhibit in the display room of the New York Edison Company. As shown in the picture, the trick consists of the introduction of a transparent "window" into the side of the cleaner bag with arrangement of an interior illumination to show up plainly the swirling activity within.



To prepare the cleaner for action, a rectangular hole or "window" is cut in the dust bag, and a few quarts of confetti are introduced therein. Lamp cord is run through the top end of the bag to operate a lamp that is properly protected by a wire-screened guard. The "window" is then covered with a transparent pane of celluloid and the motor and lamp are connected with a concealed flasher which acts at fifteen-second intervals. As the current is turned on the lamp lights up the interior of the bag, showing a swirling mass of confetti. It is a striking demonstration that attracts all eyes.

How Better Business Resulted from Late Sign Hours

For a number of years the Little Rock (Ark.) Railway & Electric Company maintained a patrol system for turning off electric signs and window lamps at hours specified by the customers, but the natural limitations of the system never proved thoroughly satisfactory to either the customers or the company. As a result, all of these signs have recently been placed on a separate circuit, controlled from the power house, and are allowed to burn until 11.30 each night, when they are shut off. Since this would cause some customers to keep their lamps going longer than formerly, it was first feared by the company that complaints would be made. Upon the presentation of the bills for the first month, however, no objections were offered and in fact some customers expressed themselves as greatly pleased with the new plan. The merchants have further investigated and found that more people stay downtown late, when all signs and windows are illuminated until 11.30, and that this meant that they could gain new customers and reap an increased profit by keeping open longer in the evening, a fact that had not been so effectually demonstrated under the former system.

Your New Home—Let It Be Electric-Lighted

"Has it electricity?" is usually the first question asked concerning a house or apartment by an intending tenant. Anticipating this demand on the part of the discriminating public, an Eastern central-station company has secured the co-operation of its local newspapers in listing rental property under the headings "Wired" and "Unwired" when the customary rental directories are issued in the early fall. To this end an extra column has been added, as shown, making co-ordinate in significance with data on size and price the answer to the all-important question, "Is it electric-lighted?"

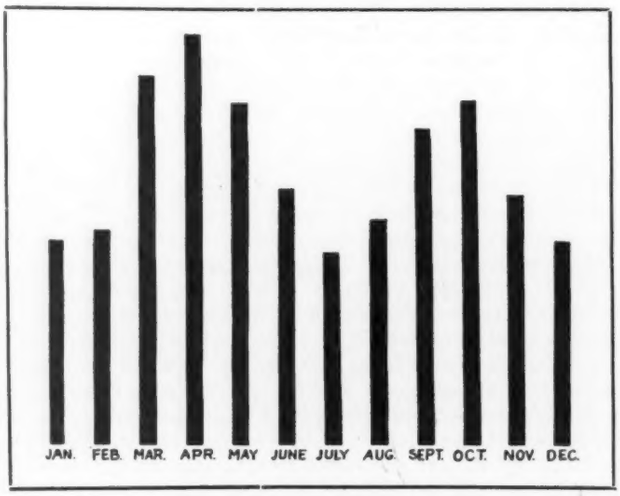
A MOVING-DAY ADVERTISEMENT IN BROOKLYN

"Move to a 'Yes' apartment"—runs the legend of the "ad"—"and you move to a castle of comfort. From the same lamp socket that furnishes you with cool, brilliant electric light you obtain power to operate the convenient time-saving and labor-saving electric iron, washer, vacuum cleaner, and cooking devices."

The Seasonable Market for House Wiring

Based on continuous experience carefully recorded over a period of eight years, the Electric Illuminating Company of Cleveland, Ohio, has developed the accompanying interesting diagram to show the variation in the amount of old house-wiring business obtainable throughout the months of the year. The information of this graph is compiled from data embracing more than 10,000 old houses wired by that company under a fixed-price-per-outlet and time-payment plan.

It is seen that spring is the "boom time" for house wiring and therefore the most productive season for



THE SPRING AND FALL DEMANDS FOR HOUSE WIRING AT CLEVELAND

easy-payment old-house-wiring campaigns; but the months of September and October nevertheless make up the second group. It is a bit of evidence worth the attention of every central-station sales manager, and proof of the priceless value of an early start in spring and fall campaigns, so that no part of the most productive months is lost to active selling. In spite of all theory of vacation hindrances in September, the experience at Cleveland shows this month to be a harvest time, and plans for the fall's work made by other central stations should take advantage of this knowledge.

Tests on Electric Trucks in Mail Service at Denver, Col.

In order to demonstrate the practicability of the electric vehicle for the use of the Denver (Col.) post office in the delivery of parcel-post matter and the collection of mail, Mr. E. M. Jackson of the Denver Gas & Electric Light Company recently conducted some interesting tests on a 1000-lb. Walker electric truck.

Starting out at 9.50 a. m., the truck delivered 195 packages in six hours and twenty-three minutes, excluding forty-nine minutes (time out) taken for shifting load in the truck and for refreshments and lunch. During this time the total travel of 46.3 miles was covered with an electricity consumption of 195 amp.-hr. At 3.6 cents per kilowatt-hour, the cost of the energy necessary to replace the 10.07 kw-hr. consumed by the trip is estimated at 51 cents, making the cost per mile for energy 1.096 cents, the cost per stop 0.35 cent, and the cost per package 0.338 cent. An average of about three stops was made per mile.

On the following day the truck was utilized to demonstrate mail-collection service. In four hours and twenty-eight minutes of actual running service, excluding the regular waits at the post office, the truck covered 26.5 miles with an electricity consumption of 123 amp.-hr., or the equivalent of 8.95 kw-hr. At the rate above, the cost of this energy would be 44.6 cents, making the cost per mile 1.7 cents, the cost per stop 0.325 cent, and the cost per collection 0.3 cent.

Symbolic Ornamental Street Lighting

Five miles north of San Bernardino, popularly known as the "Gate City of Southern California," there is emblazoned on the side of a mountain a gigantic arrow head, a curiosity of nature, which stands out so sharply that it can be distinguished easily for miles around. Accepting this symbol for their city, the merchants on Fourth Street between D Street and Arrowhead Avenue, San Bernardino, have installed ten posts, five on each side of the street, of the arrowhead design as shown herewith. The posts, which are spaced 125 ft. apart, are of cast iron and carry one 60-watt tungsten lamp at the top and fourteen 10-watt tungsten lamps on each face, giving a total connected load of 340 watts per post. Multiple wiring for the lamps is run in galvanized pipe, enameled on the inside, the pipe being under the sidewalk the full length of the north side of the block, with lateral pipes laid across the street to the posts on the other side.

The circuits are controlled by two double-pole fusible knife switches installed in the local fire station, one switch controlling the 60-watt lamps and the other the 10-watt lamps. The 10-watt lamps are extinguished at midnight, and the larger lamps are operated all night.

"ARROW-HEAD" STANDARDS AT SAN BERNARDINO

The Lynn House-Wiring Campaign

The Lynn Gas & Electric Company, Lynn, Mass., is conducting a house-wiring campaign in co-operation with the thirty-eight electrical contractors in the territory served. A uniform schedule of prices for service and the various switch connections, and for suitable lighting fixtures, has been established, as follows:

1.	Service	$11.00
2.	Cellar outlet, switch	5.50
3.	Piazza outlet, switch	7.75
4.	Hall outlet, switch	7.75
5.	Parlor outlet, switch	7.75
6.	Dining-room outlet, switch	7.75
7.	Kitchen outlet	3.25
8.	Pantry outlet	3.25
9.	China-closet outlet	3.25
10.	Back-hall outlet	3.25
11.	Second-hall outlet	3.25
12.	Bath outlet, switch	7.75
13.	Other outlets	3.25
14.	Outlets on first floor, with flush plug receptacle	4.50
15.	Extra switches	4.50
16.	Three-way switches	6.75
17.	For each floor above first	5.50
18.	Bryant-heater central combination	4.50
19.	Allowance for switches	3.25

DEMONSTRATING HOUSE-WIRING OFFERS AT LYNN

Nos. 5, 6, 11, 12, 13 apply only after service as in No. 1 and at least $13 worth of wiring on the first floor is contracted for. Armored cable is used.

The prices for fixtures are as follows: Hall (bell shade), $2; piazza globe, $1; parlor three-light shower, brass chain, $4.50; kitchen and pantry pendants, $1.25; bathroom and bedroom side brackets, $1.40; dining-room three-light shower, $5. These fixtures are of handsome brass housing with lusterless glassware.

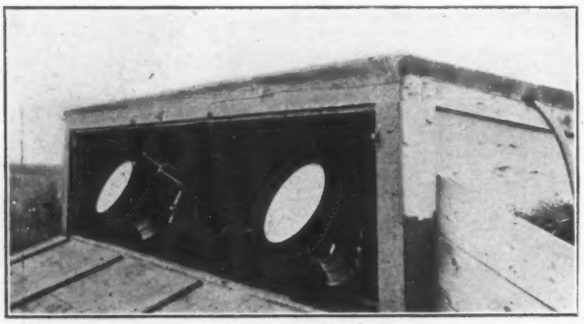
To advertise these fixtures, the company has constructed a booth to simulate the room of a house, 6 ft. square, 7 ft. 6 in. high at the eaves, and 10 ft. high over all, made of wood frame with paper-board walls tinted a robin's-egg blue inside and cream outside. The fixtures are installed from the walls and ceiling of this model house and are connected to the lighting circuits so that the lamps can be switched on as exhibited to prospective house-wiring customers at the company's building.

In case the customer desires time to pay for the installation, the lighting company will pay the contractor and accept an agreement from the owner which allows payments in twelve monthly installments, the lighting company assuming no responsibility in connection with the contract between the house owner and contractor. The company's maximum lighting rate is 10 cents per kilowatt-hour.

Electric Lighting of Trap-Shooting Range

The first trap-shooting range in New England to be equipped with artificial lighting for night shooting is that of the Paleface Gun Club at Wellington, Malden, Mass., where one of the trap boxes has been equipped with two 750-watt nitrogen lamps to illuminate the clay "pigeons" as they are hurled from the trap.

The lamps are installed 4 ft. to each side of the trap, in 14-in. metal angle reflectors. The lamps stand



CLAY-PIGEON TRAP AND PROJECTOR LAMPS

at an angle of about 28 deg. from the perpendicular and the shades at about 56 deg., both units being parallel to one another and completely flooding the area into which the "pigeons" are thrown, which is to a distance of about 40 ft. from the trap.

The lead-covered cable conductor is brought to the trap box from the club house, about 50 yd., in 1-in. conduit laid in the ground, and connections at the lamps are made in condulets secured to the floor of the box.

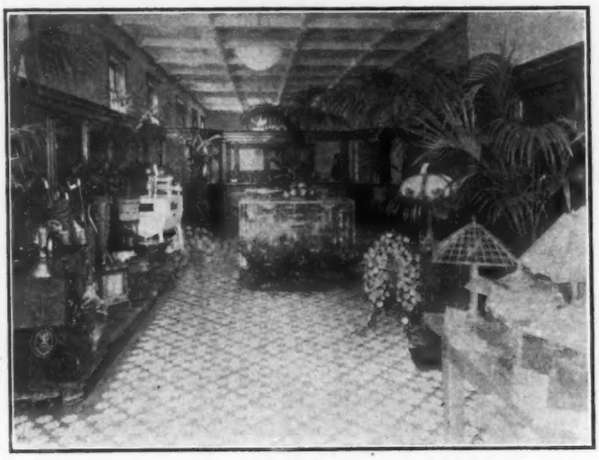
There are five "squad walks" in connection with the illuminated equipment, with gunners' positions 16 yd. to 24 yd. distant. On either side is a pole about 12 ft. high, the two being connected by a wire cable to which 40-watt tungsten lamps, with ordinary tin shades and waterproof sockets, are attached, one over each walk, and adjustable on flexible cords to give the desired height from the ground. A receptacle for connection is provided in a post 25 ft. back of the wire. Both groups of lights are controlled from the club house.

The apparatus was installed by Libby & Wischausen, local contractors, the cost being about $175, or about $1 for each club member. Energy is furnished by the Malden Electric Company.

It is said that trap shooters have been able to make even better scores when shooting under conditions of artificial light than by daylight.

Adapting a Sales Plan to a Nationality

The Edison Electric Illuminating Company of Brooklyn on Aug. 2 opened a new branch office in the Brownsville section of Brooklyn. The inhabitants of that section, totaling about 150,000, are for the most part Hebrews, and announcements of the opening in Yiddish were printed in all of the local papers. A feature of the new office is a modern electrical showroom, where



THE BROWNSVILLE OFFICE ON THE OPENING DAY

electrical household and office appliances of all kinds are demonstrated and on sale. The stock includes portable lamps, electric irons, toasters, coffee percolators, hot-water heaters, grills, vacuum cleaners, washing machines, heating pads and a complete line of electric cooking appliances. Arrangements are provided so that all business can be conducted through the branch office. The district manager and senior salesman in the new office were chosen because of their Hebrew lineage and their ability to converse in Yiddish.

THE NEW SALESROOM ATTRACTS INTEREST

Technical Advance in Theory and Practice

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Pole Form of High-Frequency Machines.—KARL SCHMIDT.—The author shows that for high-frequency machines the dimensions and forms of the poles are of importance. The ratio of pole arc to pole pitch should be smaller the greater the air-gap. Since the pole dimensions are small compared to the air-gap, the pole stray flux becomes of importance and has a considerable effect on the possible output of the machine, especially at high frequency. Hints are given for the best dimensions of the poles.—*Elek. Zeit.*, June 10, 1915.

Explosion-Proof Motors for Mines.—H. H. CLARK.—The Bureau of Mines has done considerable research work on permissible explosion-proof motors for use in places where an electric spark or flash may ignite inflammable gas or dust. This paper gives the details of construction that the bureau considers essential for satisfactory service and describes tests of an explosion-proof mining-machine motor and accessories approved by the bureau.—*Bureau of Mines, Technical Paper* 101 (1915).

Transformer Stresses.—W. E. BURNAND.—The author first discusses the stresses set up in the insulation of the end-turns on the high-tension side of transformers and then considers the destructive effects of the mutual reductance of the low-pressure leads. From the sketch it will be seen that the two leads are divided up into a number of sections relatively deep and narrow, a section of the outgoing lead alternating with a section of the return lead. This gives an almost non-inductive arrangement, with good cooling surface and convenient terminal arrangement, where the two leads are required to go close to the same spot.—London *Electrician*, Aug. 13, 1915.

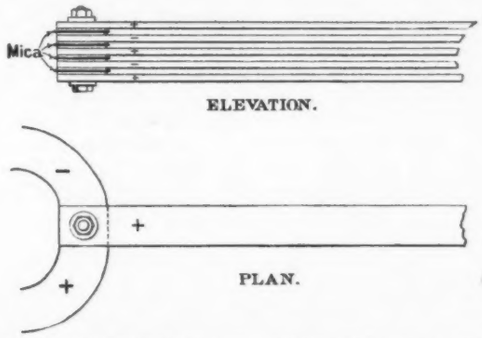


FIG. 1—INTERSPACING OF CONDUCTOR FOR HEAVY ALTERNATING CURRENTS

pulsion of the stampings and of the coils caused by short-circuits. The relative merits of many or few sections are dealt with, and a description is given of an experiment illustrating the conclusions. An arrangement for reducing the inductance of conductors carrying heavy currents is also described. In connection with an apparatus designed by the author it was desired to transmit 500 kva. at 10 volts terminal pressure a distance of a few feet. On making a preliminary experiment it was soon apparent that the 10 volts would not pass the required current through the distance required, even with the ends of the leads short-circuited—i.e., more than 500 kva. would be absorbed in the reactance of the leads in this short distance—though the true resistance loss was not of serious consequence. The method devised to get over this is shown in the accompanying diagram and is of some interest, since heavy currents are coming to be more frequently used. Especially is this true in connection with electric furnaces, the low power-factor of which in some instances may be accounted for to an unsuspected extent by the in-

Lamps and Lighting

Pocket Lamps.—A review of various new forms of pocket lamps made by German manufacturers. With respect to batteries used in pocket lamps it is pointed out that it is absurd to make such a statement as, for example, that the life of a 4.5-volt battery is ten or twelve hours, with the use of a metallic-filament lamp consuming 0.15 amp. if the discharge is carried down to 1 volt. It is well known that in good pocket instruments metallic-filament lamps consuming 0.2 amp. to 0.25 amp. or even 0.3 amp. are used, and that the discharge is practically at an end when the voltage has gone down to 1.8. In order to get a general rule it is recommended that the life of a pocket-lamp battery be defined as the time in which with a continuous discharge through a solid resistance of 15 ohms or a 3.5-volt, 0.2-amp. metallic-filament lamp the voltage goes down to 1.8. In view of the possibility of recuperation it might be possible to carry the discharge down to 1.5 volts. If the lamp is used only for short flashes—that is, if the battery is discharged intermittently—the life of the battery may be 50 per cent greater. It might be still better to rate the battery by the ampere-hours or watt-hours obtained in a discharge down to 1.8 volts, but the ordinary purchaser would not understand such a designation.—*Elek. Zeit.*, May 27, 1915.

Unit of Candle-Power.—C. C. PATERSON AND B. P. DUDDING.—Their paper in full, an abstract of which has been already noted in the Digest, on the unit of candle-power in white light.—*Phil. Mag.*, July, 1915.

Effect of Change of Lamp Voltages on Vision.—WILLIAM KUNERTH.—The author's experiments showed that changes in the potential supplied to lamps, either above or below normal, were noticeable to practically

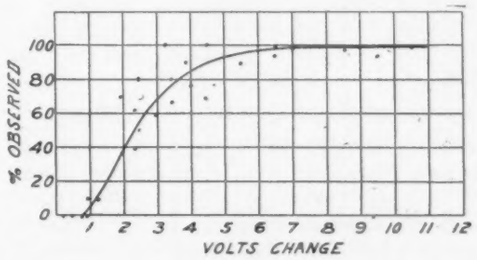


FIG. 2—PERCENTAGE OF OBSERVERS NOTICING CHANGE IN VOLTAGE OF LAMPS

every one present in the room if of more than 5.5 volts. Fluctuations became objectionable for reading to about half of the persons tested when over 11 volts, and for everyone if more than 25 volts. The persons experimented on (ten in number) were seated as to have the light fall over their shoulders. They were college stu-

dents with normal eyesight. The room was illuminated by a 100-watt, 110-volt tungsten lamp provided with a shade. The normal intensity of illumination at the various places where these subjects used the light varied from 0.84 ft.-candle to 1.44 ft.-candles. A mercury rheostat and a voltmeter were in the lamp circuit, and changes in the rheostat could be made without anyone in

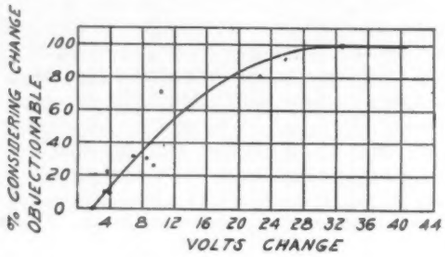


FIG. 3—PERMISSIBLE CHANGE IN LAMP VOLTAGE HAVING REGARD TO REQUIREMENTS OF READERS

the room being aware of the variations except as he noticed a change in the illumination.—*Lighting Journal*, August, 1915.

Generation, Transmission and Distribution

Swiss Water-Power Plant.—An illustrated description of the Loentsch hydroelectric station, making use of the power of the Loentsch River and of the storage reservoir of the Cloenthal Lake. The Loentsch plant operates in parallel with the Beznau plant on the Aar, and each of the two plants has a well-defined function. The Beznau plant is a station of large rating and utilizes a low fall; it assures the continuous supply of energy while the peaks are provided by the Loentsch plant. In this way it has been able to utilize the two plants to the best advantage, and 90 per cent of the power available at Beznau is now being utilized instead of 50 per cent as formerly. The two plants together have a mean rating of 45,000 hp. The maximum rating of the Loentsch plant is 22,000 kw. in December and January. It contains six generators, each rated at 5250 kw. at 8000 volts.—*La Lumière Elec.*, May 8, 15, 29 and June 5, 1915.

Cost of Operation of Power Plants.—A. SCHWAIGER.—A long article on the predetermination of the cost of operation of a power plant. Such calculations meet with some difficulties if the load of the power plant is variable, as is usually the case, and if the cost of operation of the machines, transmission lines, etc., depends on the load. The author discusses an example showing how such important economical problems may be simply solved by means of characteristic figures and curves.—*Elek. u. Masch.* (Vienna), May 30, June 6 and 13, 1915.

Installations, Systems and Appliances

Central-Station Systems of India.—The largest of the electric-power companies in India is the Tato Hydro-Electric Supply Company, whose power station now under construction at Khopoli, in the Bombay Presidency, will, when completed, have a rating of 30,000 hp. and at a later date 60,000 hp. The Cauvery Electric Power Supply Company initiated by the Mysore government is the next largest power-supply company in India, with a station rating of 16,750 hp. The head in this case is 387 ft. and the generator pressure is 2170 volts, three-phase, twenty-five cycles. The bulk of the power is used on the Kolar gold fields, 92 miles distant from the falls. The transmission is at 35,000 volts, and the distribution pressure for motor circuits is 2080 volts. The Calcutta Electric Supply Corporation is third in size, viz., 15,000 hp., its output being used almost exclusively in the largest presidency town of India for private lighting and for fans. The generator pressure is 6000 volts, three-phase, fifty cycles, and the transmission to substations is carried out at this pressure, interconnected motor converters being used to transform to continuous current at 450 volts and 225 volts for general domestic purposes. A pressure of 6000 volts is available for power. The Bombay Tramways & Electric Supply Company has a station of 12,000-hp. rating, supplying power for the electric railways and for private lighting and fan service. The station output is three-phase, fifty cycles, at 5500 volts, with continuous-current distribution to small consumers in the vicinity of the power house and three-phase distribution for large consumers and the outlying districts. Another hydroelectric plant of importance is that installed by the government of Kashmir, where a station of 7000-hp. rating has been erected for supplying power, principally for dredging purposes. The Madras Electric Supply Company's system is being reconstructed at the present writing. Its demand, however, for some time to come is likely to consist of only a lighting and fan load.—London *Electrician*, July 30, 1915.

Wires, Wiring and Conduits

Armored Single-Conductor Alternating-Current Cables.—B. EMANUEL.—Some considerations on armored single-conductor cables. When operated with alternating current they show a considerable energy loss due to hysteresis and eddy currents in the iron of the armor. In the present paper the author gives values of the energy loss and of the inductive voltage drop for all sections of cables used in common practice and for the different types of armors. It is shown that with well-designed types of armor the energy loss and the inductive voltage drop may be reduced to very small values.—*Elettrotecnica*, Jan. 5, 1915.

Installation Rules.—At the 1914 annual meeting of the German Association of Electrical Engineers it was decided that the new set of installation and wiring rules should go into force on July 1, 1915. The principal differences between the old and new rules are now summed up.—*Elek. Zeit.*, June 17, 1915.

Electrophysics and Magnetism

Conduction of Electricity Through Metals.—J. J. THOMSON.—An abstract of a paper read before the British Physical Society. The discovery by Kamerlingh Onnes that at the temperature of liquid helium some metals can exist in a state in which their specific resistance is less than the one-hundred-thousand-millionth part of that at 0 deg. C. appears to necessitate the abandonment of the ordinary theory of metallic conduction, as the experimental conditions prohibit the explanation of the phenomenon by an abnormal increase either in the number or mean free path of the free electrons. The effects observed by Kamerlingh Onnes may, however, be accounted for by a theory of metallic conduction previously given by the author in "The Corpuscular Theory of Matter." On this theory the atoms of some substances contain electrical doublets—i. e., pairs of equal and opposite electrical charges at a small distance apart. The effect of an applied emf. is to alter the heterogeneous distribution of the axes of these doublets by bringing them into partial alignment with the field. The influences preventing complete alignment are considered mathematically. The function of the applied field is to produce the alignment of the doublets; the actual transference of electricity is effected by the large inter-atomic forces brought into being by the polarization of the doublets. Thus, if the polarization remains on withdrawing the applied emf. the current

will also remain.—London *Electrician*, July 9, 1915. The article is published in *Philos. Mag.*, July, 1915.

Determination of Harmonics by the Resonance Method.—A review of two recent researches on the determination of the harmonics of an alternating-current wave by means of the resonance method. A. Blondel does not employ the usual method of constant capacity and variable self-induction for the resonance circuit, but points out that for sharpness of separation of the harmonics it is better to use in the resonance circuit a constant self-induction and a condenser of variable capacity. If an oscillograph is used, an undamped oscillograph should be selected. P. de la Gorce shows that the variations of resistance with frequency of the coils usually employed in the resonance method are comparatively enormous, and that the apparent resistances of imperfect condensers are also very large. He indicates a method of construction of the coils which reduces the variations of the resistance with the frequency.—*La Revue Elec.*, Feb. 19, 1915 (published May 14, 1915).

Miscellaneous

Patents and the War.—When war broke out in August, 1914, between Great Britain and Germany one of the first acts of the British government was to introduce a bill into Parliament to extend the powers of the Board of Trade during the continuance of hostilities to do such things as might be thought expedient for voiding or suspending, in whole or part, patents granted to persons the subjects of states at war with Great Britain. To the board power was also given to grant in favor of any person other than an alien enemy, and on such terms and conditions and for such period as it might think fit, licenses to make, use, exercise and vend patented inventions and registered designs. This act has been taken advantage of to a considerable extent, and a large number of applications for voidance or suspension of enemy-held patents and trade-marks have been filed and accepted. The Russian government, noting the steps that had been taken in England, in due course amended its own laws. The resulting Russian law is in some respects much more drastic and far-reaching than the English law. It enacts that patents are not to be granted to the subjects of states at war with Russia, that applications for patents from alien enemies are not to be received, and that proceedings on pending applications for patents by alien enemies shall be suspended. It further enacts that all patents for inventions of value for the defense of the country automatically become the property of the state, without compensation or indemnification, when such patents are enemy-held, and that the validity of all other enemy-held patents is annulled. The French patent law has also been amended, but the amended law is not so severe against the enemy as are the laws of England and of Russia, since only the exploitation of patents and the use of trade-marks belonging to Austrians, Germans and Hungarians is interdicted. Power is, however, taken to grant compulsory licenses in respect of any patented invention the use of which would be to the public interest or aid in the defense of the country. In Germany, at the outset of the war, a law was passed empowering the Federal Council to institute economic measures by way of retaliation. Up to the end of June, nevertheless, the government had not taken retaliatory action so far as concerned patents, designs and trade-marks. It has now, however, been deemed desirable to do so, and regulations have just been published from which it appears that patent and trade-mark rights belonging to subjects of enemy states may be canceled or restricted in the public interest, or the right to work and use the same may be granted to others. An official has been charged with the duty of carrying out the regulations and provided with all necessary powers to that end. It would appear from the regulations which have been published that the owners of industrial property coming within the terms of the regulations will be afforded an opportunity of opposing the cancellation or alteration of their rights.—London *Engineering*, July 30, 1915.

Book Reviews

DIELECTRIC PHENOMENA IN HIGH-VOLTAGE ENGINEERING. By F. W. Peek, Jr. New York: McGraw-Hill Book Company, Inc. 266 pages, 190 illus. Price, $3.

The title of this book suggests that it is likely to prove of interest and value to scientists and specialists only, and that its circulation among practicing electrical engineers will be very small. Those familiar with the author's writings will, however, know that they appeal to the engineer notwithstanding a treatment which may at times be mathematical, and the fact that they are mainly records of painstaking and accurate scientific investigations. The author has the gift of presenting the subject, on which he is an acknowledged authority, in such form that his conclusions and data become immediately available for the practical designer. This book is no exception in this respect. It deals not only with corona effects and losses on high-voltage transmission lines, but discusses the dielectric field and circuit generally, touching upon all matters connected with the design of high-pressure apparatus, whether the insulating material be solid, liquid, or merely the surrounding atmosphere. With the increase of working pressures it will be necessary for the electrical engineer of the future to have as thorough an understanding of the dielectric field as he now has of the magnetic field, because this knowledge is required for the correct design and proper care not only of overhead high-tension lines and insulators, but also of underground cables, transformers and transformer bushings, and indeed all electrical apparatus in which the quality, thickness and shape of the insulation must be studied on scientific lines. Although the book includes some material that has previously been published elsewhere, it contains much that is new and brings together in convenient form information and data of the greatest value to the engineer whose work involves some knowledge of high-voltage phenomena.

Books Received

Internal-Combustion Engines. By Robert L. Streeter. New York: McGraw-Hill Book Company, Inc. 418 pages, 239 illus. Price, $4.

Arithmetic of Alternating Currents. By Ellis H. Crapper. New York: The Macmillan Company. 208 pages, 45 illus. Price, 75 cents.

Practical Mechanics and Allied Subjects. By Joseph W. L. Hale. New York: McGraw-Hill Book Company, Inc. 228 pages, 201 illus. Price, $1.

Combustion and Smokeless Furnaces. By Joseph W. Hays. Published by the author at Rogers Park, Chicago, Ill. 118 pages, illustrated. Price, $2.

Plane Geometry. By Claude Irwin Palmer. Edited by George William Myers, Ph.D. Chicago: Scott, Foresman & Company. 288 pages, illustrated. Price, $1.

J. M. WAKEMAN

Men of the Industry

Changes in Personnel and Position—Biographical Notes

J. M. Wakeman, who, as the general manager of the Society for Electrical Development, Inc., is a central figure in the work of planning and executing the society's extensive arrangements for "Electrical Prosperity Week," has recently completed several extended journeys throughout the United States in the interests of the society's work and addressed many gatherings of electrical men on the plans for that week. Mr. Wakeman is widely known among electrical men and was for many years engaged in the publishing business. After a successful connection of some years with the *American Machinist* and *Locomotive Engineering*, Mr. Wakeman joined the McGraw Publishing Company at its formation in 1899, becoming one of its incorporators and first vice-president. For a number of years he was general manager of the ELECTRICAL WORLD. In 1910 he resigned in order to take a year or two of complete physical rest in Europe and to recover his former condition of health. After an absence of thirty months' residence on the Continent and in England, of which latter country he is a native, Mr. Wakeman returned to the United States and shortly afterward took up the general managership of the Society for Electrical Development, of which he has been in executive charge for the last two years.

Thomas F. Kelly, commercial manager of the Dayton Power & Light Company, Dayton, Ohio, has been appointed by President E. W. Lloyd of the National Electric Light Association State chairman of the association's membership committee for Ohio. Mr. Kelly is also a member of the company sections committee of the association for 1915-1916.

A. L. Riker, who with Howard E. Coffin has been appointed to represent the Society of Automobile Engineers on the Naval Advisory Board, of which Thomas A. Edison is chairman, is an electrical engineer by profession. As early as 1888 Mr. Riker devoted attention to electric motors with a view to developing a type suitable for vehicle propulsion. The Riker Electric Company's first electric vehicle was brought out in 1894, and some of the machines produced in 1898 are still said to be in regular operation. In 1900 Mr. Riker began the manufacture of electric trucks, but for the last thirteen years he has been vice-president of the Locomobile Company of America, and since that time has given much of his attention to the development of gasoline-engine apparatus.

A. L. Strickland is the city electrician of Ashland, Ore., succeeding H. G. Butterfield, the former superintendent.

R. L. Fitzgerald, business manager of the city of Winnetka, Ill., has succeeded F. E. Herdman as manager of the water and light department of the city. Mr. Herdman had served in this position for many years and is well known among Chicago electrical men.

Samuel Scovil, president of the Cleveland Electric Illuminating Company, Cleveland, Ohio, has been appointed chairman of the general convention committee of the Electric Vehicle Association of America, which will hold its convention at Cleveland, Oct. 18 and 19. Mathias E. Turner, general contract agent of the company, is the secretary-treasurer of the committee.

Walter H. Flandreau, who was re-elected president of the International Association of Municipal Electricians at last week's convention, held at Cincinnati, Ohio, is the city electrician of Mount Vernon, N. Y. Mr. Flandreau was born Nov. 1, 1870, in the town of Greenburg, Westchester County, N. Y. He was educated in the public schools and learned telegraphy in the railroad office at Hartsdale, N. Y. At the age

W. H. FLANDREAU

of eighteen he became a telegraph operator in the employ of the Commercial Cable Company and for seven years served as lineman and operator with the Postal Telegraph Company, opening up many new offices for that company. He was also prominently identified with the Telephone, Telegraph & Cable Company of America in its lifetime, in charge of plants at New Rochelle and Mount Vernon. Mr. Flandreau has been superintendent of fire alarms and city electrician of Mount Vernon for the last nineteen years and has been an active member of the International Association of Municipal Electricians for nine years.

R. K. SHEPPARD

Robert K. Sheppard, the president of the recently organized Associated Manufacturers of Electrical Supplies, who until recently was manager of sales for the insulated-wire department of the B. F. Goodrich Company, Akron, Ohio, has been appointed sales manager of the Simplex Wire & Cable Company, Boston, Mass. Mr. Sheppard was born at Boston in 1871 and, after attending the Newton High School, was graduated from the Massachusetts Institute of Technology in 1895 as a chemical engineer. Entering the employ of the Washburn & Moen Manufacturing Company, Worcester, Mass., he continued with that firm and with the American Steel & Wire Company, which absorbed it, until 1912. In 1899 Mr. Sheppard represented the insulated wire department of his company in New York City, and in 1902 he moved to Chicago, where he represented the insulated wire and rope department. In 1904 he took charge of the Philadelphia office, remaining there until 1912. In that year he joined the staff of the Diamond Rubber Company of Akron, Ohio, manufacturer of rubber goods, which was afterward amalgamated with the B. F. Goodrich Company. Mr. Sheppard was very active in the work which led to the formation of the Associated Manufacturers of Electrical Supplies and served as chairman of the preliminary meetings leading up to the formation of the association. In recognition of his services he was, last March, presented with a silver loving cup by the members of the organization committee.

Page C. Morris, formerly of Nelsonville, Ohio, has been appointed the vice-president and general manager of the several properties ownd and operated by the Ohio Electric Securities Company, the general offices of which are at Athens, Ohio. The subsidiary companies are the Hocking Power Company of Nelsonville, the Athens Elec-

tric Company of Athens, the Mutual Electric Company of Middleport and Pomeroy, and the Central Electric Producing Company, which has a generating station at Floodwood from which the entire territory is supplied over about 40 miles of transmission lines.

Walter S. Dickson, who has been electrical engineer with the Guggenheim Company, operator of power-transmission systems in Chile, South America, has been appointed electrical engineer with Hickey & Schneider, manfacturers of electrical transmission equipment and electrical specialties, 61 Broadway, New York City. Mr. Dickson, who is a graduate of the electrical engineering school of Columbia University, New York City, recently returned from an extended trip of inspection of the important hydroelectric transmission lines in the Middle West and on the Pacific Coast.

M. S. Seelman, Jr., who has just been appointed chairman of the "Electrical Salesman's Handbook" committee of the Commercial Section of the National Electric Light Association, has for the last fifteen years been closely associated with the commercial activities of the Edison Electric Illuminating Company of Brooklyn, whose staff he joined in 1900 as advertising manager. Mr. Seelman is now assistant to the general sales agent of the company, T. I. Jones. Mr. Seelman was born in New York City in 1868, and, after doing sales work for four years, went into the newspaper business at the age of twenty-one. His experience in this field covered reportorial, editorial and advertising work, and he continued in this connection for a number of years until his association with the Brooklyn Edison company. In 1906 Mr. Seelman won the N. E. L. A. prize for submitting the best paper on the subject of a commercial department for a city of less than 50,000 people. Later he acted

M. S. SEELMAN, JR.

for a year as editor of the Question Box of the N. E. L. A. *Bulletin.* He has served on many committees and aided in the compilation and discussion of many reports. He has also presented papers before the N. E. L. A. and the Association of Edison Illuminating Companies. During the last two years Mr. Seelman has been in charge of the work of collecting general data and editing for the "Handbook" committee under Charles J. Russell as chairman. For a number of years Mr. Seelman was also editor of the Brooklyn Company Section *Bulletin.* He was the organizer and is a past-president of the Kilowatt Club of Brooklyn.

E. N. Sanderson, president of the Federal Light & Traction Company of New York City, which is the holding company for the Gray's Harbor Railway & Light Company of Aberdeen and Hoquiam, Wash., was the guest of honor on Aug. 15 at a banquet at the Washington Hotel, Aberdeen, given by the Aberdeen Chamber of Commerce. One hundred prominent business men of Aberdeen and Hoquiam attended.

William D. Ligon, who is the president of the Electric Fuseguard Company of Newark, N. J., was until recently connected with the signal engineering department of the Interborough Rapid Transit Company of New York City and assisted in laying out the signals for the dual subway system now under construction. Prior thereto he had served for a number of years in the sales and engineering departments of the H. W. Johns-Manville Company of New York City. Mr. Ligon is a graduate of the Virginia Polytechnic Institute of Plattsburg, Va., receiving in 1899 his degree in electrical and mechanical engineering. Following graduation he was appointed assistant professor in mechanical engineering at the Miller Manual Labor School of Virginia. After serving with the Ohio Brass Company at Mansfield, Ohio, he joined the staff of the Westinghouse company at Pittsburgh in 1901, becoming a member of the transformer engineering department one year later. Three years, from 1904 to 1907, were spent in the Syracuse office of the Westinghouse company in charge of central-station work, and in 1907 Mr. Ligon was appointed general factory manager for the D. & W. Fuse Company of Providence, R. I.

Obituary

George M. Curtis, treasurer and a director of the Meriden Electric Company and of the Meriden Gas Light Company, Meriden, Conn., died at his home at Meriden, from heart disease. Aug. 28. Mr. Curtis was fifty-eight years of age and was an official in many industrial companies and banks in Connecticut.

Max Hebgen, general manager of the Montana Power Company, whose death at Chicago Aug. 24 was announced briefly in these columns last week, was born at Milwaukee, Wis., forty-six years ago and began his career with the Standard Underground Cable Company and the Westinghouse company at Pittsburgh, Pa., about 1886. After working in the shops of these companies, Mr. Hebgen removed to Butte, Mont., taking employment as a lineman with the old Butte Electric Light & Power Company in 1888. This company was at that time principally owned by ex-Senator William A. Clark of Montana and his immediate associates. Mr. Hebgen remained continuously in the employ of this company through its various changes, and at the time of his death he was vice-president and chief engineer of the Montana Power Company. This company, which is a monument to the creative genius of Mr. Hebgen, has water-power developments on the Big Hole River; on the Missouri River, at Great

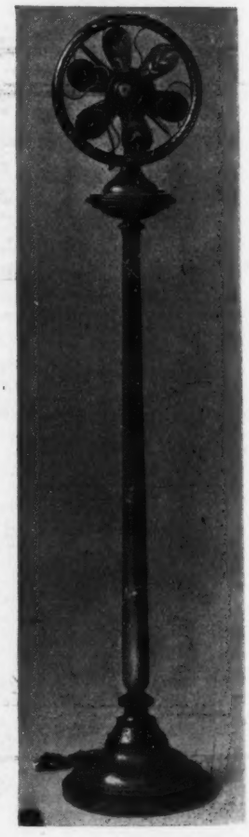
MAX HEBGEN

Falls; on the Yellowstone River, at Billings, and on the Madison River. One of the largest hydroelectric companies in existence, it has been uniformly successful, both financially and as an operating organization, in solving successfully and largely from an original standpoint the engineering problems encountered. Among the many applications of its vast output are the supply of electricity for the electric operation of the Butte, Anaconda & Pacific Railroad and the electrification, now under way, of the Bitter Root Mountain division of the Chicago, Milwaukee & Puget Sound Railway. In the work of organizing the Montana Power Company Mr. Hebgen was connected with Mr. H. M. Byllesby, who writes of his former associate: "Mr. Hebgen was an intense worker and a man entirely self-educated. He entered his profession endowed with magnificent health, a sound intellect, a distinct inventive capacity, and an unlimited ability for hard and successful work. He was beloved by all who knew him, and it is probable that no more successful or popular officer of any corporation has existed than Mr. Hebgen, who, while occupying this position of great popularity in the organization, was also a thorough disciplinarian. His popularity, indeed, was based on the profound respect which his organization held for his character, his abilities, and his physical and moral courage." Mr. Hebgen is survived by his widow and one son.

New Apparatus and Appliances

READERS of the ELECTRICAL WORLD may be grouped into three classes: users, recommenders and sellers of electrical appliances or apparatus. As the journal of an industry, the ELECTRICAL WORLD presents answers to three questions: "Why?" "How?" and "With what?" This department primarily concerns itself with the third question. It describes "with what" plans and methods for widening the application of electricity may be put into practice. In fifty-two preceding issues something more than 1100 new apparatus and appliances have been described. During the fall months lighting equipment and supplies in all classes, domestic appliances in wide variety, electrical specialties for office, store and factory, industrial electrical appliances, and equipment for the economical generation and distribution of electrical energy, will be described, showing how such apparatus and appliances will help readers put their plans into practice.

Ornamental Fans and Fan Stands



Artistically designed stands and hand-decorated fans, conforming in color and finish to furniture of various periods, are being made by the Crucet Manufacturing Company, 256 West Twenty-eighth Street, New York. In the accompanying illustrations are shown stands of the Adam, Louis XVI and Chinese designs. That of the Adam design is 15 in. high and is of hard wood. It is finished in rubber enamel with dark-blue body. The two Louis XVI stands are 5 ft. 6 in. high and 12 in. high respectively. The larger stand is of hard wood with clean-cut relief work and is finished in ivory-white enamel. The smaller stand is also of hard wood and is finished in dull-ivory enamel with black lacquer stripes. The large stand of Chinese design shown is finished in black lacquer with hand-painted decorations. Either 8-in. or 12-in. oscillating fans, the blades of which are hand-decorated, may be used with the stands, to which they are securely attached. The 8-in. fans are of Diehl make and the 12-in. fans of Westinghouse make. They operate on either alternating current or direct current, the 12-in. fans on 110 volts to 115 volts and the 8-in. fans on 120 volts. All of the fans are equipped with wooden rims outside the guards which serve as additional protection against injury. The stands are so wired that connections can be made from the bottom of the bases to floor outlets. Cords of 6-ft. or 8-ft. lengths of any color desired may also be utilized. The fan stands are easily portable and are well adapted for use in dwelling houses, high-class offices and stores, and also as a decorative feature in window displays. Design patents for the various types of fan stands have been applied for.

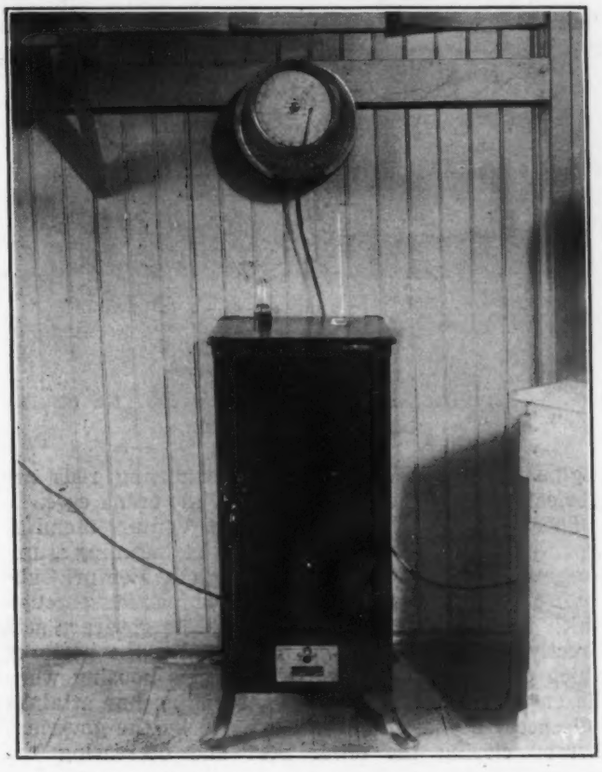
Electric Oven for Testing Shrapnel

An interesting development in the form of an automatic thermostatically controlled electric oven is now being manufactured by the Hughes Electric Heating Company of Chicago, Ill.

The oven has been designed for use in one of the government arsenals in Pennsylvania for the testing of shrapnel shells. In the testing of these shells it is necessary that a temperature of 120 deg. Fahr. be maintained continuously for twenty-four hours. The control of temperature is obtained by means of a compact thermostat which makes and breaks the heating cirucit. One contact point is carried by the expansion member of the device, and the other is adjustable by means of a thumb-screw which extends outside the

case. A condenser across the contact points is said to hold the arcing down to practically nothing.

The oven is fitted with a mercurial thermometer for indicating the temperature. It is also fitted with a pilot lamp, connected in parallel with the heating element,



THERMOSTATICALLY CONTROLLED OVEN FOR TESTING SHRAPNEL

to indicate when the current is on and off. On a continuous test for twenty-four hours, the temperature of the oven, it is claimed, did not vary more than 1 deg.

Polyphase Induction Motors with Special Ventilation Features

A line of polyphase induction motors of the squirrel-cage type in which special attention has been given in the design to structural, electrical and ventilating features has recently been developed by the Diehl Manufacturing Company, Elizabeth, N. J. The frame is of the skeleton type, being made of cast iron and carefully proportioned to provide adequate ventilating space without sacrificing strength and rigidity. The end bonnets are of the same material and are of the mill type, being made interchangeable and so drilled as to permit of rotating them for mounting the motor on floors, walls or ceiling. Interchangeable bearings are also employed, being made large in size and being provided with ring oilers of large diameter so as to prevent throwing oil. The bearings are dust-proof by virtue of carefully designed oil-hole covers, oil-vent covers and a medallion cap provided on the front bearing housing.

For the stator and rotor cores a special grade of sheet-steel annealed laminations is used. The shafts are made from a special grade of mild steel carefully ground to gage size at the bearing surfaces and rotor punching seat, a liberal oil sling being turned integral with the shaft at the ends. These shafts are universally interchangeable between motors of the same frame sizes.

The stator windings are first partly formed and shaped and then inserted into the heavy insulated semi-inclosed stator slots. For motor sizes above 20 hp., however, open slots and form-wound coils are used. Six terminal leads are taken out in the case of three-phase

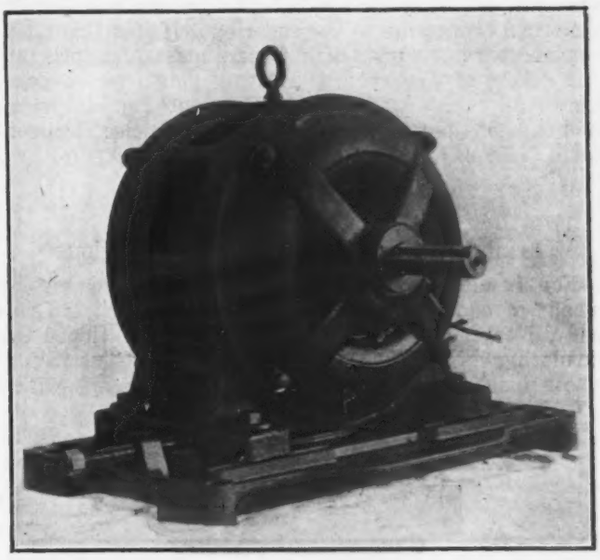


FIG. 1—SQUIRREL-CAGE POLYPHASE INDUCTION MOTOR

motors, and four in the case of two-phase motors, soft rubber insulating bushings being provided for each lead. Riveted to each end of the rotor core are ventilating blades which maintain a continuous flow of air drawn in through the end-bonnet openings, passing first over the lower, then over the upper sides of the coils, and finally passing over the exposed portions of the stator core,

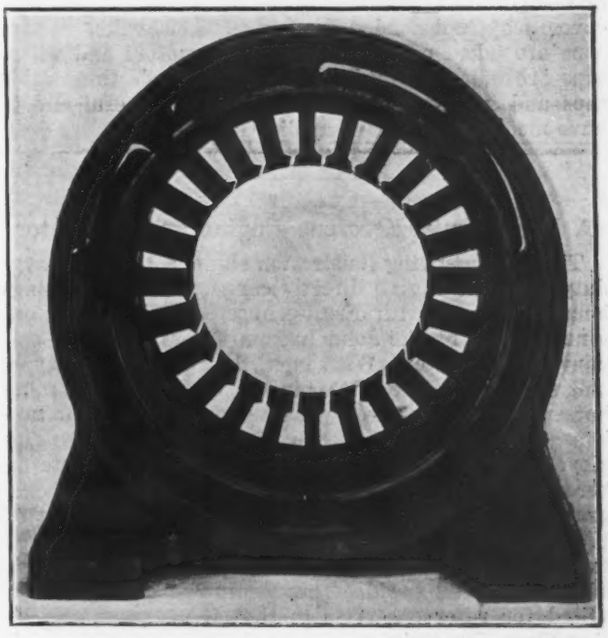


FIG. 2—SKELETON-TYPE CAST-IRON FRAME

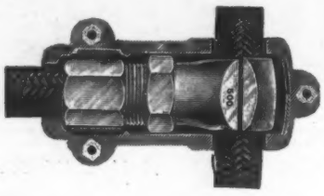
being ejected through openings in the yoke. The result, the manufacturer claims, is a positive directive ventilation.

The rotor winding is of the regular squirrel-cage type. That portion of the winding which goes into the rotor slots consists of round copper bars. These rotor bars are provided with a shoulder on the projecting end,

the tip being carefully turned to size so that a close fit is insured in the end rings, which are pressed into the projecting tips of the rotor bars. These tips are then headed over to form a regular rivet head. During the operation of heading over the tips the body of the tip expands, insuring an absolutely tight fit and perfect electrical connection to the end rings. After this riveting process is completed the entire mass is dipped into hot solder of a very high melting point, which penetrates all recesses, completely covering the end rings and ends of the rotor bars, preserving the electrical contacts from any possibility of corrosion.

Insulating Cover for Branch Connections

For insulating branch connections when made by means of cable taps manufactured by Dossert & Company, New York City, this company has developed the insulating cover shown in the accompanying illustration. These insulating covers are made in two parts which



CABLE TAP AND SECTION OF INSULATING COVER

when joined together are held by threaded bolts screwing into metal inserts in the insulating material. They can hence be readily installed or removed. The insulating material composing these covers has good mechanical strength with no tendency to expand, contract or deteriorate in service. Tests have shown that these covers may be depended upon up to 28,000 volts. Where taps are taken off main feeders for motors and where taps are taken off busbars of switchboards these cable taps and insulators are said to be very useful and to have met with extensive application.

A Heavy-Duty Kerosene Engine and Generator

The accompanying illustration shows a 100-hp. heavy-duty kerosene engine directly connected to a Westinghouse alternator with direct-connected exciter. The engine is made by the John Lauson Manufacturing Company, New Holstein, Wis., is of the four-cylinder type, and said to operate on 1 pint of kerosene per brake-horsepower under three-quarters load. Overhead tablets and valves in the heads of the cylinders are employed, the arrangement being designed to operate on kerosene oil or gasoline and fuels having a specific gravity of 35 deg. Baumé scale and a flashing point of 170 deg. Fahr. Gasoline is used in starting engines of this design, but kerosene is substituted after the engine has reached full speed. This feature makes them well suited for reserve service in that the engines can be started quickly and will assume their share of the load. In case alternators are connected to the engines the regulation is sufficiently close to enable parallel operation.

The cylinders are provided with extra large water spaces and clean-out plates at their lower ends. Water jackets are also employed on the cylinder heads which carry the valves, the latter being installed in such a manner as to bring the water in close contact with the valve heads. Any cylinder head can be removed without disturbing any other head or any adjustment on the engine. For circulating the cooling water a water-circulating pump is mounted directly on the engine and is driven by means of a chain and sprockets directly from the crank shaft.

Lubrication is effected by means of a Madison-Kipp force-feed oil pump supplying the five bearings of the

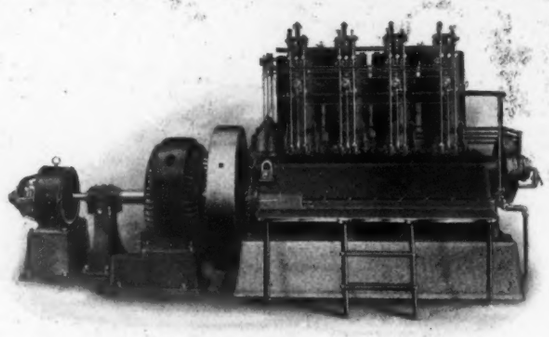


FIG. 1—FOUR-CYLINDER, HEAVY-DUTY KEROSENE ENGINE DRIVING ALTERNATOR

engine and the cylinders. The connecting rods are lubricated by means of splash from the crank case.

The fuel-feeding device is of the Venturi atomizer type, the action of which depends on maintaining a uniformly high velocity of air through a Venturi tube having radial holes in its restricted portion through which fuel is admitted by suction. The governor acts directly upon a two-ported barrel valve the ports of which coincide with ports in the valve housing when the engine is at rest. When the engine has attained full speed the barrel valve is rotated by the governor, thereby closing the lower port and decreasing the amount of fuel and air admitted into the cylinder. Simultaneously with the closing of the lower port the upper port is also closed, deflecting more air through the nozzle and maintaining practically a constant veloc-

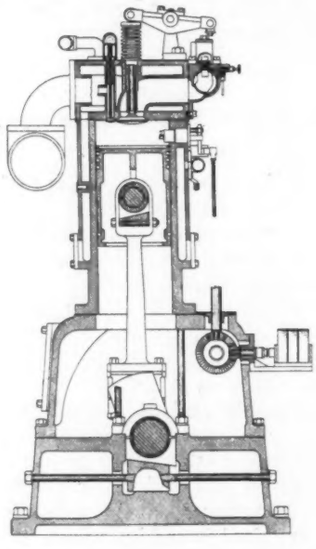


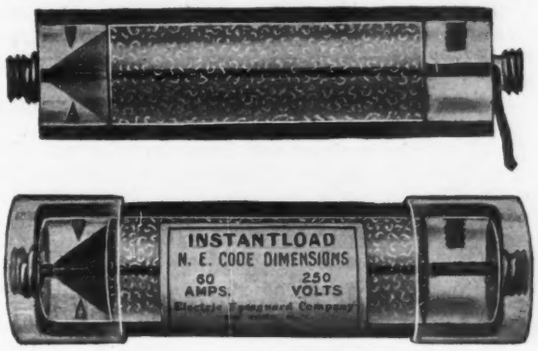
FIG. 2—SECTION THROUGH CYLINDER, SHOWING WATER JACKET AND VALVE

ity at this point. Adjustments for no load and full load are made by means of the fuel needle valve in conjunction with a butterfly valve in the air inlet. A separate carburetor or atomizer is provided for each cylinder to prevent liquefaction of the fuel before it reaches the cylinder. A water feed is provided to prevent premature ignition on full load.

Ignition is of the standard make-and-break type and is arranged with two timing adjustments, one individual and one simultaneous, the latter being used in starting. An air starter, which is connected to the end of the cam shaft by means of a flexible coupling and admits air into the cylinder on the expansion stroke through an automatic air valve in the head, is also provided.

Refillable Fuse of Simple Design

In the accompanying illustrations is shown a refillable fuse which, it is claimed, can be renewed in half a minute. In order to refill one of these fuses, the ferrule or knife-blade caps should be renewed. The new fuse



FERRULE-TYPE REFILLABLE FUSE

wire is then inserted through one of the end holes thus made accessible. As these holes are just large enough to accommodate fuse wire of the proper rating, it is impossible to insert a fuse wire of too great a carrying capacity. After the wire has been inserted it is wound around the binding posts at each end and the end caps are replaced. The manufacturer, the Electric Fuseguard Company, Newark, N. Y., claims that the advantages of this type of fuse are reliability, a cost saving of about 90 per cent, minimum amount of time required for refilling, simplicity, and high-grade construction, asbestos being used as a lining.

Combined Dimming Socket and Shade Holder

A combination dimming socket and shade holder has been placed on the market by the Wirt Company, Philadelphia, Pa. This socket, which is shown in the accompanying illustration, is so arranged that five steps can be obtained in the luminous intensity of a lamp

COMBINATION SOCKET

placed in the socket, namely, full, half, dim, "night-light" and out. The socket is of the pull-chain type and is made of brass, the shell being extended to form a shade holder. A slight turn to the right enables the cap to be removed, providing easy means for wiring. Porcelain insulation and special resistance units are employed.

Steel Poles of Increased Unit Strength

A pole manufactured from a special rolled H-beam section by an expansion process which increases the strength about 400 per cent without adding to the weight has recently been placed on the market. Comparatively light sections, which, as they come from the rolls, would not be strong enough to serve as poles in

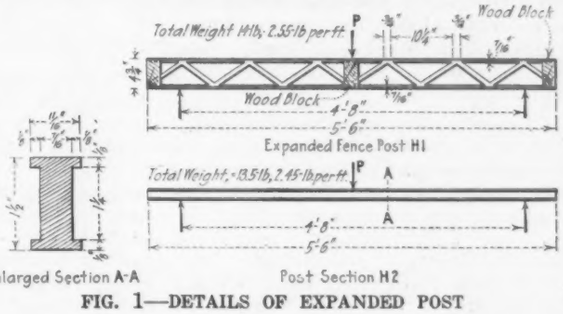


FIG. 1—DETAILS OF EXPANDED POST

span-wire construction, are sheared, expanded hot, treated in a preservative bath, and formed into Warren trusses which are of sufficient strength to meet any average line demand. An expanded 6-in., H-section, 30-ft. pole weighs about 588 lb. and tapers from 6 in. at the top to 17 in. at the base. Careful tests to determine the strength of this pole indicate that it will carry eighty No. 8 wires at 100-ft. spacing or twelve No. 4 wires at 300 ft. spacing.

The advantages claimed for this pole by the Bates Expanded Steel Truss Company, Chicago, Ill., the manufacturer, include the points that it is primarily a lightweight steel structure of great strength which may be purchased and installed at a cost of material and labor a little greater than that of a wooden pole line. Maxi-

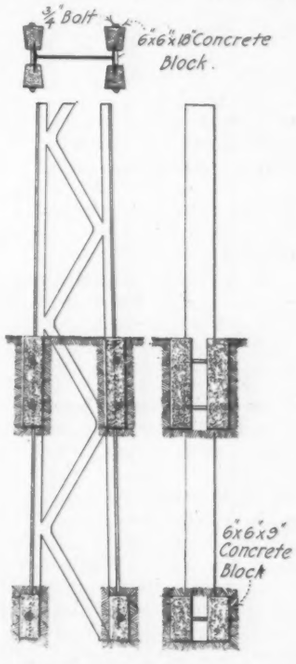


FIG. 2—FRONT AND SIDE VIEW OF POLE, SHOWING SETTING AND CONSTRUCTION

mum life is obtained by setting these poles in concrete. The metal is ¼ in. thick. As all parts are accessible for painting, the poles when painted will resist corrosion for a long time. Wooden or steel cross-arms may be attached to these poles by L-bolts, the poles being drilled for any number of cross-arms at the time they are manufactured.

Windmill Power Plant for Mission in Arctic Circle.—To take advantage of the winds which blow continuously at Mount Hope, a mission settlement 100 miles north of the Arctic Circle, an electric-lighting plant driven by great windmills is to be erected. Four hundred people live at Mount Hope during the long Arctic winter, and as fuel is at a premium there, the steady winds, which seldom fall below twenty miles per hour, are to be used to advantage, it is explained.

Comparison Between Electric and Hydraulic Elevators.—In 1914 records were kept on five new electric elevators and an equal number of hydraulic elevators performing similar service at the City Hall of Philadelphia. The records show the following comparison: During the year it was necessary to make 346 repairs to the electric elevators and 815 repairs to the hydraulic elevators. In the twelve months there were 74 electric-car hours of service lost and 280 hydraulic-car hours.

Electric Pumping for Church Organs.—Pipe organs in the older Louisville churches are being rapidly electrified. Scarcely a week now passes, according to reports from that city, in which there is not at least one contract let for displacing the old water-power equipment by an electric motor. The motor commonly used is a 2-hp. single-phase. The motors can be thrown in and out by the organist. Formerly the caretakers had to watch the water systems in cold weather, but this is, of course, no longer necessary.

An Electrical Machine for Solving Equations.—A French author has suggested the possibility of devising an electrical machine for solving numerical equations of any degree. The arrangement consists essentially of a cascade connection of various electromagnetic machines, the armature current of one being used in the excitation circuit of the next, etc. A commentator on the first author's work has now demonstrated that by the cascade connection of transformers one would be theoretically able not only to solve algebraic equations but also linear differential equations with constant coefficients.

Electric Light on Columbus' Flagship.—Anchored in the Hudson River near the Fort Lee Ferry, New York City, where with the aid of big electric signs it competes with nearby amusement resorts for the curiosity seekers' attention—and dimes—is a replica of Columbus' flagship, the Santa Maria, one of the three caravels built for exhibition at Chicago at the time of the World's Columbian Exposition, and which until a few months ago rested in peaceful anchorage in the Jackson Park lagoon, that city. The vessel is an exact historical duplicate in all dimensions of the frail galleon in which Columbus set sail for the New World 400 years ago, and with the aid of electric lamps strung across its quarter deck and in the cockpit, the visitor may inspect in comfort and leisure the fifteenth-century relics under twentieth-century illumination.

Multiphase Currents

Miscellaneous News Items Picked from the Happenings of the Industry

"Hurry-Up" Construction in an Automobile Factory.—The enormous "production pressure" under which all apparatus, including electrical machinery, is worked in the automobile factories of Detroit is shown by a statement of the electrical engineer for one of the plants. He had been speaking of making a connection in a set of 4600-volt, three-phase leads to an oil switch and concluded by saying: "It took us only eighteen minutes to make and complete the joints in those 4-0 copper leads. We had previously cut away the 3/16-in. rubber insulation and had the connectors ready. After the joint in the copper had been made it was taped and finished. The total time that the circuit was 'dead' was only eighteen minutes."

Corporation Jobs as Fellowships in N. Y. U. Commercial Course.—As part of the instructional work offered by the School of Commerce of New York University, "business fellowships" with a number of large industrial corporations are offered students who wish to combine practical experience with theoretical instruction in business subjects. Fifteen of these business fellowships are now available, the men to fill them being chosen, on their basis of individual adaptability, by Prof. Jeremiah W. Jenks, head of the Graduate School, and by the chiefs of the employing organizations. The corporations co-operating in the plan include the American Telephone & Telegraph Company, the Western Electric Company and the National City Bank of New York.

The Quarter-Century Span of the Electrical Industry.—The first annual outing of the Quarter Century Club of the General Electric Company factory at Schenectady, N. Y., to Lake George, Aug. 28, emphasized the fact that most of the members of the twenty-five-year organization were connected with the company at the very beginning of the period of rapid development of the electrical industry, that is, in 1890. Two hundred and six of the 500 members of the Quarter Century Club made the excursion to Lake George. The average age of the members of the party was fifty-two years, the youngest member was thirty-eight and the oldest seventy-four. G. E. Emmons held the record for longest continuous service, thirty-four years. C. E. Coffin, chairman of the board, and President E. W. Rice, Jr., are both members of the Quarter Century Club.

Institute of Radio Engineers.—On Thursday and Friday afternoons, Sept. 16 and 17, joint meetings of the Institute of Radio Engineers and the American Institute of Electrical Engineers will be held at the Native Sons of the Golden West Hall, San Francisco. Two papers for the radio engineers will be presented, one on each day. On Sept. 16 Prof. Harris J. Ryan will read the results of investigations on the "Sustained Radio-Frequency High-Voltage Discharge," by Roland G. Marx and himself, taking up the flame and brush types of discharge obtained from conductors when a powerful arc generator is used to apply voltages up to 50,000 at frequencies as high as 200,000 cycles per second. On Sept. 17 Robert H. Marriott will read a paper on "Radio Development in the United States," giving especial attention to Pacific Coast conditions.

Failure to Advertise for Bids Renders Light Bill Invalid.—In preparing an opinion for a special committee of the Bucyrus (Ohio) Council, Solicitor J. W. Wright concludes that the Bucyrus Electric Light & Power Company cannot collect from the city its bill of $4,336.47 rendered for lighting service under a temporary contract entered into between the city and F. C. Kingsbury on June 7, 1909. Mr. Wright claims the bill cannot be paid out of the city treasury because in making the contract the service director then in office, on the evidence of the record, failed to advertise for bids as the law provides. "It is not a question of whether it is a just bill or not," said Mr. Wright, "for even if there were no question of its validity, the city could not legally pay it. It is well settled that a municipality can become obligated only in the manner fixed by statute, and persons dealing with a municipal corporation must ascertain at their own peril that contracts are made in accordance with the statutes."

Electric Light for Home Treatment.—The *Journal of the American Medical Association* calls attention to the circulation work of a Chicago publishing concern which is putting out a book on "Beauty and Motherhood." In this volume considerable space is devoted to the self-treatment of disease by means of electric light. "The ordinary electric light of the home, if used properly," writes the author, "can cure many diseases, acute and chronic, and relieves pain promptly." To further the circulation of the book the publisher has written to public service corporations offering through the volume to increase local sales of electricity by one-third or more and to open up a large new field for the consumption of electric energy. In one such letter the publisher wrote: "With the people's interest in light treatments aroused, a new vast field for the use of electricity is opened, with unlimited possibilities for you. Thus, Mrs. —— of Chicago, after reading 'Beauty and Motherhood,' procured a 250-cp. bulb and has used it ever since. Her lighting bills average double the former figures. In fact, she is recommending the light enthusiastically to friends and neighbors. This is but one of the many instances in which 'Beauty and Motherhood' has either doubled or tripled the light bills of old customers, or forced electric light into new houses."

News of the Industry

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

Associations and Societies

Associated Manufacturers of Electrical Supplies.—A meeting of the board of governors of the Associated Manufacturers of Electrical Supplies will be held at the Hotel Biltmore, New York City, Sept. 9, 8 p. m. Mr. C. E. Dustin, 62 Cedar Street, New York City, is the general secretary of the association.

Association of Edison Illuminating Companies.—The thirty-sixth annual convention of the Association of Edison Illuminating Companies will be held at Spring Lake Beach, N. J., Sept. 13 to 16. Following is the program: Tuesday Morning—Report of committee on meters, O. J. Bushnell, chairman; report of committee on reporting decisions of public service commissions, E. W. Burdette, chairman; paper, "Electricity for Everybody, a Complete Canvass of the Boston Edison Territory," by Leavitt L. Edgar. Tuesday Afternoon—Reports of committee on electric plant, R. F. Schuchardt, chairman; committee on steam plant, J. W. Parker, chairman, and committee to confer with the Bureau of Standards, W. C. L. Eglin chairman. Wednesday Morning—Report of committees on residential service rate, Alex Dow, chairman; paper, "Analysis of Costs of an Electricity Supply Company." Wednesday Evening—Addresses by Samuel Insull, president Commonwealth Edison Company, Chicago; Thomas N. McCarter, president Public Service Electric Company of New Jersey, and Frank A. Vanderlip, president National City Bank, New York. Thursday Morning—Reports of committee on street lighting, J. W. Cowles, chairman, and committee on incandescent lamps, J. W. Lieb, chairman.

Meeting of the Indiana Association.—The seventh annual convention of the Indiana Electric Light Association will be held at the Hotel Deming, Terre Haute, Ind., Sept. 8, 9 and 10. The following papers are scheduled for presentation: "Investment and Return," by Halford Erickson of the Wisconsin Railroad Commission; "Stability in the Electric Light and Power Industry," by Frederic Nicholas, associate editor of the ELECTRICAL WORLD; "Methods of Determining Maximum Demands for Rate-Making Purposes," by Emmet Ralston of the Indianapolis Light & Heat Company; "Some Off-Peak Loads," by Q. A. Brackett, engineer of the Westinghouse Electric & Manufacturing Company, Pittsburgh; "The Incandescent Lamp of 1915," by Preston S. Millar of the Electrical Testing Laboratories, New York; "Accounting," by Fred L. Dennis of the Indiana & Michigan Electric Company; "Overhead Construction," by E. J. Condon, Jr., of the Indiana Utilities Company, and "Direct-Current and Alternating-Current Lines and Their Value," by R. E. Russell, commercial engineer of the General Electric Company, Schenectady, N. Y. Among other entertainment features will be a special automobile tour for the men to electrically equipped coal mines. Thomas Donohue, Lafayette, Ind., is secretary of the association.

San Francisco Convention of American Electrochemical Society.—Following is a list of the papers which have been accepted and placed upon the program of the annual meeting of the American Electrochemical Society, to be held at San Francisco, Sept. 16 to 18: Charles H. Aldrich, "The Cottrell Process on Silver Furnace Gases"; R. S. Bosworth, "Collection and Therapeutic Use of Radium Emanation"; G. H. Clevenger, "Electrolytic Precipitation of Gold, Silver and Copper from Cyanide Solutions"; F. R. Pyne, "Solution Stratification as an Aid to the Purification of Electrolytes"; Lawrence Addicks, "Electrolysis of Copper Sulphate Liquors Using Carbon Anodes"; W. R. Mott, "Use of the Flaming Arc in Paint and Dye Testing"; W. P. Davey, "Radiography of Metals"; Anson G. Betts, "Electrolytic Antimony Refining"; C. W. Bennett, C. C. Rose and L. G. Tinkler, "Electrodeposition of Nickel"; D. R. Lyon and R. M. Keeney, "Power for Electrochemical Industries"; W. D. Bancroft, "Peptonization of Chromium Oxide"; F. M. Frederiksen, "Synthesis of Phenylhydroxylamine"; F. T. Snyder, "Electric Steel Costs"; R. S. Wile, "Electric Furnace Melting of Ferroalloys"; W. H. Wills, Jr., and A. H. Schuyler, "Heat Losses from an Electric Steel Furnace"; J. W. Beckman, "Electrochemical Possibilities on the Pacific Coast"; W. D. Bancroft, "Electromotive Forces."

A. I. E. E. Meetings.—At a regular meeting of the American Institute of Electrical Engineers to be held in New York, Oct. 8, P. M. Lincoln will present a paper on "Rates and Rate Making." Arrangements have been made for an Institute meeting to be held in Philadelphia on Oct. 11, 1915. A two-day Institute meeting will be held at the Planters' Hotel, St. Louis, Mo., on Oct 19 and 20. There will be four technical sessions, and the following papers will be presented: "Municipal Co-operation in Public Utility Management," by Philip J. Kealy; "Automatic Control," by C. W. Place; "Recent Results Obtained from Preservative Treatment of Telephone Poles," by F. L. Rhodes; "To the Engineering Experiment Station of the University of Illinois," by Ellery B. Paine; "The Magnetic Properties of Some Iron Alloys Melted in Vacuo," by Trygve D. Jensen; "Displaced Hysteresis Loops," by L. W. Chubb and T. Spooner; "Pole-Face Losses," by Prof. A. S. Langdorf; "The Unsymmetrical Hysteresis Loop," by J. D. Ball; "Decomposing Magnetic Fields Into Their Higher Harmonics," by H. Weichsel; "The Repulsion-Start Induction Motor," by J. L. Hamilton; "Single-Phase Squirrel-Cage Motor with Large Slanting Torque and Phase Compensation," by Val A. Fynn; "Calculation of the Long-Distance Transmission Lines Under Constant Alternating Voltage," by Prof. George R. Dean.

Convention Program of Northwest Association.—A tentative program for the eighth annual convention of the Northwest Electric Light & Power Association has been issued for the meeting, which will be held in Portland, Ore., on Sept. 8, 9 and 10. A large attendance is expected from Pacific Northwest central stations, and in addition a number of California delegates will be on hand to participate in the debate on electric cooking. The cooking report will be from a special committee that was appointed immediately after the N. E. L. A. convention in San Francisco in June. Following is the tentative program: Call to order, by Franklin T. Griffith, president of Portland Railway, Light & Power Company; address of welcome, by H. R. Albee, Mayor of the city of Portland; president's address, by O. B. Coldwell, Portland Railway, Light & Power Company; "The Small-Consumer Question," by Hugo Eisenmenger, National Lamp Works; "Apportionment as Applied to Analyses of Cost of the Light and Power Business," by J. A. Rockwood, Portland Railway, Light & Power Company; "Special Features of Stand-by Steam-Power Plant Design and Operation," by E. D. Searing, Portland Railway, Light & Power Company; report of overhead-line committee, by J. C. Martin, Pacific Power & Light Company, Portland; "Development of Small Motor and Appliance Load," by L. M. Simpson and H. B. Peirce, Spokane, Wash.; "Determination of Maximum Demand," by V. H. Greisser and H. B. Peirce, Washington Water-Power Company, Spokane; "Practical Application of Modern Illumination," by F. H. Murphy and George Kumler, Portland; report of the committee on electric cooking and heating, by W. R. Putnam, Utah Power & Light Company, Salt Lake City. The annual banquet will be held at the Multnomah Hotel, Sept. 10. For Sept. 11 a picnic has been planned to be held at Oneonta Gorge, about 30 miles east of Portland, on the newly constructed Columbia River Highway.

Public Service Commission News

New York Commissions

The Public Service Commission, Second District, cannot compel the Nassau Light & Power Company to string its wires on the poles of the Glen Cove Light & Power Company in Dosoris Way, Glen Cove, and has dismissed the complaint asking that the companies use poles jointly. The Nassau company has a contract for street lighting in Dosoris Way, while the Glen Cove company now has a line of poles there upon which it furnishes electricity to private users. The Nassau company is willing to erect its own poles and carry out its street-lighting contract, but will not string its wires on the other company's poles. "While the commission can readily see how much better it would be for the appearance of the street if there were only one line of poles in the Dosoris Way," says the order, "yet, under the circumstances, it has no power to compel the Nassau company to abandon any of the rights which it claims under its existing franchise, nor has it any right so far as the record in this case is concerned to compel the Nassau company to put its wires on the poles of the Glen Cove company in Dosoris Way."

Connecticut Commission

The order of the commission approving rules, regulations and standards for electric companies became effective on Aug. 1, with the condition, however, that no provision thereof shall be construed to prevent an electric company from making a special contract with any customer involving quality or service conditions at variance with those established, and provided further that the rules may be modified by the commission, as applicable to any particular company, upon petition and proof that it is impracticable for such company under its financial or operating conditions to comply fully with certain designated stipulations.

Nothing in the order establishing rules, regulations and standards shall be construed to be within the penal provisions of Chapter 128 of the public acts of 1911 unless and until the commission shall issue a further order in the premises directed to any or all of such electric companies, fixing by mandatory order the initial efficiency of electric lamps furnished by such companies, the voltage at which electrical energy shall be distributed, or any other specific requirement of the rules, regulations and standards subject to the order. However, a failure on the part of any electric company to comply with the rules, regulations and standards established (or as the same may hereafter be modified as applicable to any particular company) shall be prima facie evidence against such company that the operation or service involved is not of the standard required by the commission.

Special rules cover maintenance of plant, equipment and facilities. It is contemplated that rules and standards for joint use of poles will be issued later, pending which the recommendations made by the commission pertaining to this subject will remain in force.

Massachusetts Commission

The Massachusetts Public Service Commission has handed down a decision granting the Norfolk & Bristol Street Railway authority to increase its fares. The decision is the third of its kind within a year, the Middlesex & Boston Street Railway and the Blue Hills Street Railway having been granted fare increases according to a well-defined policy of the commission which recognizes the importance of additional revenue in cases where the petitioner demonstrates its necessity. The income of the Norfolk & Bristol Street Railway from 1909 to 1915 inclusive shows a net divisible income ranging from 0 to 6 per cent on the stock and averaging 3.27 per cent over and above operating expenses and fixed charges. The commission states that "as they stand these figures indicate an inadequate return on the stockholders' investment." The inspection department of the board estimates about $14,000 as the average expenditure which should henceforth be made each year for several years in order to maintain tracks and overhead structures in a safe and proper condition and about $11,000 for maintenance and depreciation of equipment. It appears that for the past two years if the company had expended $25,000 a year for maintenance and depreciation it would have shown a deficit during that period. In order to make up this deficiency and permit of a 6 per cent return to the stockholders, says the decision, the company must show an increase of more than $13,000 over its average net earnings for the past two years. With possible economies in operation the company would appear on this basis to be entitled to an additional revenue of something more than $10,000 a year. The company in its petition states that an additional revenue of $10,000 a year could be raised by making the cash fare 6 cents within the limits of any fare zones and by the issuance of ticket books. The proposed new schedule has met the approval of the Public Service Commission in its essential features.

Wisconsin Commission

The Wisconsin commission has authorized the Ashland Light, Power & Street Railway Company to issue $100,000 in first mortgage 5 per cent bonds to be sold at not less than 75 per cent of par. The funds to be derived are to be used to defray the cost of building a 1500-kw. Curtis steam turbine plant in the city of Ashland to supplement the company's hydroelectric plant, which does not develop sufficient energy at times of low water.

The Hussa Brothers Light & Water Company of Bangor has been ordered to decrease its rate for street lighting from $27 per 48-cp. lamp per year to $22. The commission submitted data showing that whereas the cost of energy per kilowatt-hour generated, exclusive of fixed charges, was 6.63 cents in Bangor as against a weighted average for all the Class C plants of 6.71 cents, the cost of street lighting per capita was $2.18 as against a weighted average of $1.01 for the Class C plants. The company is also ordered to substitute a minimum charge of 75 cents per month in lieu of the meter rental of 25 cents now charged, and to abandon its practice of furnishing free service to its employees.

Upon complaint of citizens of Viola, the commission has investigated the rates charged by the Viola Light & Power Company and has ordered a reduction in the rates for street and commercial lighting. The schedule prescribed for commercial lighting consists of a primary charge of 12 cents net for the first 20 kw.-hr. consumed per month, a secondary rate of 9 cents net for the next 30 kw.-hr., and an excess rate of 6 cents for all energy consumed in excess of 50 kw.-hr. per month. The present rates are 13.5 cents, 12 cents and 10 cents respectively. The rate for the 60-cp., 6.6 amp. series incandescent street lamps burning on a moonlight schedule from dusk to midnight and from 5 a. m. to daylight was reduced from $24 per lamp a year to $20. The business of the company justifies a greater reduction in net revenues than will result from the rates authorized, but the commission held that a further reduction should not be made at this time in view of the necessity of amortizing some of the early losses which the plant has suffered through the loss of the dam by high water.

California Commission

In the application of the People's Water Company for reorganization before the California Railroad Commission, Commissioner Edwin O. Egerton discussed the several methods of arriving at value which should be considered. To quote the commissioner:

"Various methods have been put forward of determining the value of a public utility plant. These methods include a determination of the original cost of the plant by inspecting the records of the company, the opinion of engineers as to the original cost based upon the reproduction of the plant as of the time it was constructed under the methods then existing, but applying present-day unit prices, and an opinion as to the cost of reproducing the plant at the present time less depreciation representing deterioration found now to exist in the plant as it is.

"I hold that these methods are merely guides in the determination of value, and it cannot be said that any one of these methods may be selected and followed strictly to a result which produces, without modification, a thorough value. For instance, the method most favored of recent years is reproduction new less depreciation, but a very brief consideration of this method will at once make it apparent that in many instances serious modifications of the result obtained must be indulged in to avoid absurd and unjust results.

"I believe the 'reproduction new' method is valuable as a guide in arriving at the value, but I believe it only to be a guide.

"It has been urged at times that the true measure of value is the actual investment or original cost. But, in addition to the fact that it is usually impossible to obtain accurate data as to original cost of the properties which have been established and operated for a number of years, there is the further difficulty that if the original cost showed extravagant expenditure or expenditure made largely in excess of that which was necessary because of some interests of the constructors, aside and apart from the utility itself, it must be modified to a point where it is made reasonable. Furthermore, we have the important element of appreciation in land values to deal with, and it has been held by our courts that a utility is not bound by the original cost of its land. I do not mean to say that original cost is not to be considered and given weight, but I do say that original cost if it can be obtained does not of necessity fix the value of the plant.

"It is my opinion that in determining the value of a plant methods of arriving at depreciation are valuable only as they indicate the present condition and the probable future life of the structures."

In finding a fair and reasonable value of this utility upon which the issuance of securities could be authorized, the commission considered its properties under five heads, namely, land, physical structures, water rights, going concern, and rights-of-way. The engineers had placed a value of $50,000 per 1,000,000 gal. on an estimated output of undeveloped sources, but the commission held that as a considerable amount of money and effort is required to secure this supply of undeveloped water upon which a value was placed, and as at present such supply does not exist, no allowance can be made therefor. After a review of the various claims under the head of going concern, it was held that where it can be shown as a matter of actual cost that a company has expended a given sum of money to obtain its business, and that this was done economically within a reasonable time and with good business judgment, the resultant business is of value to the company to the extent of its expenditures to obtain it.

Washington Commission

As the result of a hearing recently held, the Public Service Commission of Washington forbids the 159 telephone companies operating in the State of Washington to collect deposits from subscribers and requires the refunding within twenty days of all deposits now held. Following are the complete rules as adopted by the Public Service Commission:

"No cash deposit or other security for installation of instruments, for the payment of accounts, for local exchange service or long-distance service points within the State of Washington, or for any other purpose, shall be required of any telephone subscriber by any telephone company (other than a city or a town) owning, operating or managing any telephone line or part of telephone line used for the conduct of the business of affording telephonic communications for hire within the State of Washington, provided that deposits may be required for any local or long-distance call originating at a pay station.

"The company may disconnect any telephone, private exchange or other instrumentality, device or apparatus, or any subscriber, and discontinue such subscriber's service, on or after the expiration of ten days from the date on which any account for local exchange service or long-distance service becomes due and payable (in advance or otherwise), when any such account remains unpaid after the expiration of ten days from such date. Any telephone company may exact from any subscriber two months' rental in advance at the time of ordering service, such charge in no case to exceed $5. If the service charge ordered shall exceed the sum of $5 per month, the patrons shall pay from month to month in advance. If the service charge shall not exceed the sum of $5, the portion not absorbed in the first month's rental shall be applied on a succeeding month's rental, and the patron shall thereafter pay from month to month in advance. No advance payment shall be exacted from the patron of the company on account of change of residence or telephone."

Corporate and Financial

Assessed Valuation of Ohio Utilities Increased.—An addition of $9,683,710 has been made to the assessed valuations of Ohio public utilities as recently announced by the State Tax Commission. Of the total gain, $4,721,380 has been added to the valuations of electric-lighting companies, their aggregate being boosted from $36,964,730 last year to $41,686,110 this year. More than a fourth of the total increase in this valuation is contributed by the Cleveland Electric Illuminating Company, for which the total is raised from $17,792,560 to $19,097,830, an increase of $1,305,270. The $986,130 increase of the Dayton Power & Light Company ranks next, its valuation being raised from $3,876,790 to $4,862,920. The Auglaize Power Company is set down as worth $400,000. Other increases are as follows: Cleveland Light & Power Company, $2,560; Bradley Light, Heat & Power Company, $27,670; Claxton Power Company, $27,840; Oberlin Gas & Electric Company, $28,010; Sandusky Gas & Electric Company, $23,740; Massillon Electric & Gas Company, $119,470; Medina Electric Light & Power Company, $4,000; Rocky River Water, Light & Power Company, $6,780; Trumbull Public Service Company, $221,190, and Canton Electric Company, $215,840.

American Public Utilities Company, Grand Rapids, Mich.—The report of the directors of the company presented at the annual meeting reviews the operations of the subsidiary companies for the year ended June 30, 1915. It points out that, notwithstanding a condition of diminished industrial activity in Indianapolis which has prevailed during the year, the commercial business of the Merchants' Heat & Light Company has shown a substantial growth. The electric load of the plant has been satisfactory. A load-factor of 74 per cent was maintained for a large portion of a three months' period. During the fiscal year the contract for municipal street lighting was entered upon and is now being carried out. In spite of the fact that the city lighting load taken on is a very large one, coming in at the later hours of the daytime and at night, the business of the company has been so developed that the peak of the load comes during the morning hours. An extensive publicity campaign, conducted for the double purpose of giving the local public an adequate idea of the importance of the company and its facilities for doing business and of attracting new business, was carried on at an expense which the directors feel has been justified by the tactical and financial results realized. The Wisconsin-Minnesota Light & Power Company, another subsidiary, during the year reported a contract with the Consumers' Power Company of St. Paul by which this company purchases for a large amount of energy its own requirements and those of the Minneapolis General Electric Company for a period of thirty years. Under the terms of this contract the Consumers' Power Company purchases a stated amount of energy in 1917, increasing the amount each year until 1921, when the maximum requirements of the contract will be reached. The performance of this contract will call for the expenditure by the Wisconsin-Minnesota company of approximately $2,500,000 in new work and developments. Summing up the report, the directors say: "The period of depression, countrywide, of which the past fiscal year was a portion, has made it seem the part of prudence to seek to conserve the volume of business already aggregated, rather than to make any expensive attempts to secure new business in communities whose population were having the necessity of retrenchment in living expenses brought home to them daily. By much the same process of reason your directors felt it to be good conservation to take advantage of lowered prices and increased efficiency of capital by making such betterments to the properties of the subsidiary companies as would make them better revenue producers with the return of good times. This company, following out this policy, is through its subsidiary, the Wisconsin-Minnesota Light & Power Company, now actually engaged in the preliminaries of the construction of a most important hydroelectric producing station on the Chippewa River in Wisconsin, thereby developing the potential values acquired in the past and making itself ready to secure the income already engaged in the contract with the Consumers' Power Company of St. Paul at the earliest date that income production becomes possible under the terms of that contract. While this new

investment will itself become remunerative immediately upon its completion in 1917, it will have a secondary effect of rendering remunerative the forward investment already made in the water-power resources now and for some time held in an undeveloped condition. This double purpose, once served, should have an exceedingly favorable effect upon the company's revenues by reducing the amount of investment in properties held to await development." The earnings of the subsidiary companies for the twelve months ended June 30, 1915, follow:

Gross earnings from operations		$2,932,070
Operating expenses		1,618,239
Net earnings from operations		$1,313,831
Miscellaneous income		25,929
Gross income		$1,339,760
Less expenses		38,101
Net income		$1,301,659
Fixed charges:		
Interest on underlying securities	$862,300	
Interest on collateral trust bonds	34,667	
Interest on gold notes	11,183	
Miscellaneous interest	43,958	
Total interest charges		$952,108
Remainder		$349,551
Dividend on preferred stock		234,840
Balance		$114,711

Atlantic City (N. J.) Electric Company.—The outstanding 6 per cent cumulative preferred stock of the company was recently increased from $300,000 to $370,200. The increase is now being offered at $98 per share. The earnings for the company for the twelve months ended May 31 are as follows:

	1915	1914
Gross operating revenue	$493,232	$466,059
Total net revenue	262,468	238,615
Interest charges	131,476	120,873
Net income after charges	130,992	117,742
Annual dividends on preferred stock	22,212	.....
Balance	108,780	.....

Atlantic Power & Light Corporation, New York, N. Y.—The 7 per cent preferred stock of the company is being offered at 95 and accrued dividend with a privilege of buying common stock at $10 per share in an amount not exceeding half the number of preferred shares purchased. A consolidated statement of the earnings of the subsidiary companies after eliminating intercompany charges for the year ended June 30 follows:

	1915	1914
Gross operating revenue	$1,125,057	$1,068,650
Operating expenses and taxes	574,323	614,983
Net operating revenue	$550,734	$453,667
Other income	6,219	3,166
Total corporate income	$556,953	$456,833
Deductions:		
Rental for properties leased	365,000	365,000
General interest	1,016	.....
Depreciation and contingencies reserve	32,113	1,336
Net corporate income applicable to dividends	$158,824	$90,497
Annual dividends on preferred stock	57,750	.....
Balance available for common stock dividends, etc.	$101,074	.....

Dayton (Ohio) Power & Light Company.—The Public Utilities Commission of Ohio has authorized the company to pledge $120,000 of its 6 per cent cumulative preferred capital stock as collateral security for a loan of $75,000. The company was authorized to issue $300,000 of this stock on May 24 at not less than 87½, but, owing to the stringent condition of the market, the company found itself unable to dispose of any of its capital stock, and, being in need of money at the present time to meet legal obligations, it petitioned the commission to authorize the above action.

Hawks Electric Company, Goshen, Ind.—The Indiana Public Service Commission has authorized this company to execute a mortgage on its property for $250,000 and to issue at this time $128,000 of bonds under the mortgage at not less than 93. The proceeds of the sale are to reimburse the treasury for $29,957 for expenditures made, to purchase the Home Electric Company of Wakarusa, Ind., for the sum of $10,000, and to pay for the construction of a new transmission line from Goshen to Bremen. The Home Electric Company has been purchasing its energy from the Hawks company for some time, and since the Home company at this time was in need of money to make extensions the Hawks company found the situation favorable for purchasing the plant.

Illinois Traction Company, Peoria, Ill.—The annual report for the year ended Dec. 31, 1914, states that close application in the effort to secure more efficiency and economy in the operation of generating stations and reduction of all items of expense which could be effected without detriment to the properties resulted in a gratifying decrease in operating costs. Satisfactory increases are shown in the electric and gas departments. They were obtained by judicious advertising and strenuous campaigns and by the introduction of improved appliances for the use of gas and electricity. Electric railway receipts have been affected by the general business depression, which caused the closing of many factories in whole or in part, and by the increased use both in town and country of the automobile, resulting in a slight decrease in the earnings of these properties. Receipts and expenditures for the year follow:

Earnings:	
Interurban lines	$3,626,635
City lines	3,021,860
Gas	877,982
Electric	3,002,378
Heat	314,640
Water	14,386
Miscellaneous	254,973
Total gross earnings	$11,112,854
Total operating expenses, including taxes	6,587,463
Net from operation	$4,525,391
Interest on bonds, etc.	3,290,786
Balance	$1,234,605
Depreciation	309,580
Balance	$925,025
Bond discount for 1914	47,956
Surplus, 1914	$877,069

Manufacturing and Industrial

B. J. Morrison, general manager of the National Supply & Equipment Company of Philadelphia, has left for Europe on a three to five months' business trip as consulting engineer for some American companies.

The Electric Shop has recently been opened at St. Joseph, Mo., by A. L. Utz, who was formerly connected with the Standard Electric Company. The new company, which will have its establishment at 918 Francis Street, will deal in electric supplies, appliances and devices, besides doing general electric contracting and repair work.

The Spengler-Loomis Manufacturing Company of 58 East Washington Street, Chicago, Ill., has decided to take up the manufacture of electrical heating appliances and has retained H. O. Swoboda of Pittsburgh, Pa., as its consulting engineer. It is expected that several of the new heating devices will be ready for the market in two months.

The Layne & Dewler Company, Houston, Tex., well contractor and manufacturer of the "Layne" centrifugal pumps and well screens, has opened a general sales office at 715 Long Building, Kansas City, Mo. The company, which specializes in city contracts for water supply, was awarded the gold medal at the Panama-Pacific Exposition on its screens and pumps for mining, irrigation and water-well purposes.

Great Demand for Tungsten in European Countries.—According to consular reports, the great demand for tungsten in Europe and the competition of buyers have doubled the price of tungsten in Portugal during the last six months. The production of this metal in Portugal during the year 1913 was 753 tons, valued at $564,000. At Sheffield, England, the prices for ferro-tungsten have risen to $1.64 per pound of tungsten contained in the alloy and to $1.82 per pound for tungsten powder, 96 to 98 per cent pure.

Large Demand for Ornamental Fans and Fan Stands.—The ornamental fans and fan stands described elsewhere in this issue have been meeting with considerable favor in many high-class homes in New York and vicinity, according to the maker, the Crucet Manufacturing Company, 256 West Twenty-eighth Street, New York. A number of these fans have been sold through Mrs. Alex Van R. Barnewall, a prominent interior decorator of New York. Recently Lord & Taylor devoted considerable window space to the display of ten different types of the fans and stands.

New Plant for Hamilton-Beach Company.—Work has been started on the new factory building of the Hamilton-Beach Company, manufacturer of electric vibrators at Racine, Wis, Work will be rushed, as the contract specifies that the building shall be ready for occupancy by Dec. 1. The building, which will be three stories high, will be 300 ft. long and 50 ft. wide. The power plant will be in a separate building, and athletic grounds will be provided for the benefit of the employees.

Organization of Vosburgh Miniature Lamp Company.—The Vosburgh Miniature Lamp Company, 289 Valley Road, West Orange, N. J., which, as reported in the ELECTRICAL WORLD of Aug. 14, has been incorporated with a capital stock of $25,000, will manufacture tungsten and gas-filled automobile lamps and will endeavor to develop a line of no-glare automobile lamps. This company is the successor to the firm of the same name, the business of which was conducted for thirteen years by Frank A. Vosburgh, who is president and treasurer of the newly incorporated company. Arthur A. Tanner is vice-president of the company, and Frank R. Weller is secretary.

The Edison Storage Battery Company, Orange, N. J., announces that Bertram Smith has been appointed manager of the Detroit office of the company. About a year and a half ago Mr. Smith joined the Edison interests as assistant manager of the Edison Storage Battery Supply Company of San Francisco. Directly previous to his connection with the Edison company he was manager of the battery department of the Chicago branch of the United States Light & Heating Company. He was formerly secretary and treasurer of the National Battery Company of Buffalo. In order to serve better its customers in eastern Michigan as well as Ohio and adjoining territory, the Edison Storage Battery Company recently moved its Cleveland office to the David Whitney Building, Detroit.

Matthews Anchors Reduced in Price and Sold Under Guarantee.—W. N. Matthews & Brother, St. Louis, Mo., having learned that less than 1 per cent of their anchors had their helix castings broken in transit or in handling by men before and during installation, have decided to make the following offer: If any casting, whether eye or helix, of a Matthews "Scrulix" anchor is broken in transit or before or during installation, the company will replace the broken casting and will guarantee that the threads in the helix and the eye of its 5-in., 6-in. and 7-in. anchors are equal in strength to the rods to which they are attached. Owing to the fact that the company's anchors have no steel in them and because of increased sales and perfection in manufacturing methods, an average reduction in price of about 25 per cent has been effected.

General Electric's "Home Electrical" Wins Awards.—The "Home Electrical," the exhibit of the General Electric Company at the Panama-Pacific International Exposition, has received the distinction of being awarded two gold medals by the International Jury of Awards. One of the gold medals was awarded by the department of manufacture for the completeness of the exhibit and for its value as an Exposition attraction. The second gold medal was awarded by the department of education in recognition of the high educational value of the display. The "Home Electrical" consists of a full-sized model home of simple Spanish-California bungalow design in which electric energy is made to perform practically all of the domestic tasks and labors and to conduce to many of the household comforts of living. Thus far more than 700,000 sightseers have passed through the house.

Waverley Electric to Increase Output.—During the 1916 automobile season the manufacturers of the Waverley electric expect to put out two thousand cars, which is just double the 1915 output. It has been possible to do this owing to improved factory conditions and increased facilities for manufacture. The company has of late been endeavoring to decrease its overhead costs by increasing its operating efficiency. As was noted in our issue of Aug. 28, the price of the Waverley electric has been reduced. This action was brought about entirely by the above conditions, which allowed the company to take the entire benefit of reduced cost due to quantity production. At the present time indications point to an excellent 1916 season. In New York City and the East it is not expected that the price reduction will be instrumental in materially increasing the demand for "electrics." In the Middle West, however, Illinois, Ohio, Iowa, etc., and on the Pacific Coast, it is expected that the reduction will greatly increase the volume of sales.

Russian Electrical Manufacturing Companies Do Well.—The electrical manufacturers in Russia possessing a good organization both for buying raw materials and selling their products, as well as abundant working capital, were never more prosperous than they have been of late, according to an article in a recent issue of the London *Electrical Review*. That this is so can be seen from the following figures from published reports for the year 1914, which show profits in roubles:

	1912	1913	1914
General Electricity Company	1,300,000	1,750,000	2,070,000
United Cables Company	970,000	1,400,000	3,340,000
Siemens & Halske	640,000	500,000	810,000
Duflon Constanovitch & Company	240,000	250,000	350,000
Siemens-Schuckert	..	1,300,000	1,150,000

The net profit of the United Cables Company was 55.6 per cent on its nominal capital, or more than double that of 1913. The company was able to show such increases because it had in stock reserves of metals and other necessary goods for production which had been bought in the first half of the year at low prices, while finished products were sold in the second half year, when prices steadily rose.

Copper.—Copper has again taken a turn in price. From the low price of 16 cents quoted a couple of weeks ago the price has risen to 18 cents, around which figure it has hovered for some days. In these figures the copper trade sees evidences of a renewal of buying orders, which have been notably absent now for some time. Just what the top prices will be producers seem to be unable to forecast. The demand of ammunition makers is not known nor is it certain. Manufacturers are known to be getting low in their stocks, and some are anticipating future deliveries by asking for part shipments at the present time. Copper exports for the fiscal year ended June 30 showed a decrease of almost 300,000,000 lb. The total for the past year was 677,303,822 lb. against 974,791,676 lb. for the previous twelve months. The average export price in 1915 fell off some 0.6 cent from 1914 and over 2 cents from 1913. Full details of the past three years' exports (in pounds) follow:

	1915	1914	1913
Austria-Hungary	2,984,987	42,276,448	37,122,105
Belgium	775,060	8,587,024	8,134,400
France	171,202,554	173,301,960	129,634,052
Germany	22,253,505	311,107,962	280,930,086
Italy	100,409,208	45,361,782	43,897,333
Netherlands	31,507,151	179,130,877	174,776,184
Russia	16,749,206	9,394,980	5,870,877
United Kingdom	238,567,045	150,863,375	111,583,321
Other Europe	63,759,425	17,787,668	10,101,291
Canada	20,659,139	28,973,421	37,648,142
Other countries	8,436,042	8,006,179	5,834,595
Totals	677,303,822	974,791,676	845,532,387

Recapitulation:

June 30	Pounds	Value	Average Export Price (Cents)
1915	677,303,822	$96,238,800	14.209
1914	974,791,676	144,895,519	14.864
1913	845,532,387	138,301,482	16.3

Capacity Business for Lamp-Post Manufacturer.—With the factory working to capacity and iron molders working day and night, the J. L. Mott Iron Works find business in electric-lamp standards of an exceedingly prosperous nature. At the present time the company has in the neighborhood of $250,000 of orders booked for future delivery. These include orders for both the export and domestic trade. In Greater New York the company has orders for approximately 4000 ornamental standards. It is to supply 500 for Philadelphia, 109 for Meriden, Conn., and 115 for Port Jervis, N. Y., besides numerous other smaller orders for Western cities particularly. Recent orders include substantial ones for Havana, Cuba, and Lima, Peru. The export trade to South America in lamp-posts is picking up. The withdrawal of European banking facilities has caused a stringency of money in this market. As money conditions become better, however, a brisk trade is anticipated. The South Americans are very particular about the street standards. They have excellent artistic taste, and for that reason will buy more expensive types than the average American municipality. The American city, without an art commission, will almost invariably choose for weight and size. Just before the war started the company had made a wedge in the English mar-

ket through the British Westinghouse company with an order for 100 standards. While no more orders have come since then, it is expected that on the conclusion of the war a large export business in lamp standards will develop not only with England but with the rest of Europe also. The company is exceedingly optimistic and feels that prosperity in the electrical industry is a matter not only of the future but also of the present.

NEW YORK METAL MARKET PRICES

	Aug. 24 Selling Prices Bid	Asked	Aug. 31 Selling Prices Bid	Asked
Copper	£ s d		£ s d	
London, standard spot*	67 5 0		68 10 0	
Prime Lake	16.12½	to 16.37½	17.50	to 17.87½†
Electrolytic	15.87½	to 16.12½	17.37½	to 17.62½†
Casting	15.50	to 15.75	16.50	to 17.00†
Copper wire base	19.00†		19.25†	
Lead	4.50		4.90	
Nickel	50.00	to 52.00†	.....	.....
Sheet zinc, f.o.b. smelter	21.00†		16.00†	
Spelter, spot	14.25	to 14.75†	16.50	to 16.75†
Tin, straits	33.75		33.50	
Aluminum, 98 to 99 per cent	32.00	to 34.00	35.00	to 37.00

***OLD METALS**

Heavy copper and wire	15.25	15.75
Brass, heavy	10.25	10.75
Brass, light	8.50	9.50
Lead, heavy	4.12½	4.60
Zinc, scrap	9.50	14.00

***COPPER EXPORTS**

Total tons to Aug. 31 15,168

*From daily transactions on the New York Metal Exchange.
†Nominal.

New Industrial Companies

The Salzer Electric Company of Cleveland, Ohio, has been incorporated with a capital stock of $30,000 by I. J. Salzer.

The Sanitary Stove Top Company of Newark, N. J., has been incorporated by William W. Smith, William A. White, E. Carlyle Fenwick and others. The company is capitalized at $50,000 and proposes to manufacture coal, gas and electric ranges, stoves, etc. The company's offices are at 9 Clinton Street, Newark.

E. M. Brown of Hempstead, Mass., has filed articles of incorporation with a capital of $30,000 for the purpose of doing an engineering, general contracting and construction business, manufacturing machinery, electrical appliances, hardware, etc. The incorporators are A. H. Courtenay, E. H. Brown and G. L. Brown of Hempstead.

New Incorporations

The Greensboro Mills Company of Greensboro, Vt., has been incorporated for the purpose of developing land and water-power, to generate electricity and to control and use water-power rights and privileges.

The Central Vermont Power Company, Montpelier, Vt., has been incorporated with a capital stock of $200,000 for the purpose of developing and operating water-powers and generating, transmitting and selling electricity.

The Nunda Electric Light Company of Nunda, N. Y., has been incorporated with a capital stock of $10,000 to generate light, heat and power. The directors are L. A. Willard and M. L. and H. J. Gordon, Nunda, N. Y.

The Mount Vernon Light & Power Company of Mount Vernon, Me., has been incorporated with a capital stock of $10,000. The officers are: Rosendall H. Jacobs, president, and Clyde M. Jacobs, treasurer. R. W. Leighton is clerk.

The Independent Heat & Light Company of Ogden, Utah, has been incorporated with a capital stock of $70,000. The officers are: A. J. Paulson, president; B. P. Critchlow, vice-president, and W. J. Critchlow, secretary and treasurer.

The Jacksonville Light & Power Company of Jacksonville, Ala., has been incorporated with a capital stock of $10,000 for the purpose of operating electric light and power plants and transmission lines. The officers are: Thomas W. Martin, president; W. R. Loyd, vice-president, and Wiley Alford, secretary and treasurer.

Trade Publications

Wiring Devices.—The Pass & Seymour Company, Solvay, N. Y., has issued Catalog No. 23, on handy electric wiring devices.

Post-Hole Digger.—Several leaflets illustrating and describing the "Goheen" post-hole digger have been issued by the Triple Tool Company, Jacksonville, Ill.

Electric Washer.—An illustrated folder describing the "King" electric washer is being distributed by the Rex Manufacturing Company, Johnstown, Pa.

Electric Motor Chairs.—The Electric Motor Chair Company, San Francisco, Cal., has issued a booklet illustrating and describing its storage-battery roller chairs.

Cooking Devices.—The Globe Stove & Range Company, Kokomo, Ind., has issued Catalog No. 37, illustrating and describing electric ranges, ovens, hot-plates, etc.

Automobile Signals.—Traffic-direction and speed signals of the electrically operated type for use on automobiles are described in a bulletin issued by C. A. Singer, St. Louis, Mo.

Inclosed Fuses.—The interior construction and the principles of operation of "D & W" fuses are described in a recent booklet issued by the D & W Fuse Company, Providence, R. I.

Switchboard Meters.—An illustrated Bulletin, No. 42, describing the mechanical and electrical details of switchboard meters has been issued by the Sangamo Electric Company, Springfield, Ill.

Outlet Boxes and Covers.—Leaflet No. 151, giving catalog numbers and other data on outlet boxes and covers, has recently been issued by the Steel City Electric Company, Pittsburgh, Pa.

Motors.—The Bodine Electric Company, Chicago, Ill., has issued illustrated Bulletin No. 520, describing and giving data on its interchangeable motors for use on both alternating-current and direct-current energy.

Folding Portable Lamp.—The folding and adjustable features of the "Jules" folding portable lamp are described and illustrated in several folders recently published by the Rose-Strauss Company, New York City.

Electric Bells and Annunciators.—Wall cards calling attention to the important features of bells and annunciators manufactured by Edwards & Company, Inc., New York City, are being distributed by the company.

Insulated Screwdriver.—A circular illustrating and describing a rubber-insulated screwdriver for use around automobiles, gas engines and electric motors has been issued by H. D. Smith & Company, Plantsville, Conn.

Insulation.—A booklet illustrating and describing the insulating products of the General Bakelite Company, New York City, has been published for distribution at the company's exhibit at the Panama-Pacific Exposition.

Flashlamps and Batteries.—The Usona Manufacturing Company, New York, N. Y., has issued a thirty-two-page catalog illustrating and describing its full line of flashlamps, flashlamp batteries, flashlamp novelties, etc.

Automatic Reclosing Circuit Breakers.—The Automatic Reclosing Circuit Breaker Company, Columbus, Ohio, has recently issued two folders on "types C and D" automatic reclosing circuit-breakers and magnetically operated switches.

Sheet-Metal Products.—The Globe Iron Roofing & Corrugating Company, Inc., Cincinnati, Ohio, has issued an illustrated catalog covering corrugated metal sheets, metal ceilings and facings, and numerous other sheet-metal building materials.

Boiler-Furnace Linings.—An illustrated description of the methods employed and the materials used in constructing one-piece furnace linings for boilers by means of a special plastic compound is given in a booklet recently issued by the Betson Plastic Fire Brick Company, Rome, N. Y.

Diesel Engines for Water-Works. — The Busch - Sulzer Brothers Diesel Engine Company, St. Louis, Mo., has issued a pamphlet on the Appleton (Wis.) water-works describing features of intake and filtration results from a bacteriological standpoint. Data on economical Diesel-engine operation, efficiency charts and operating data are given.

Construction News

New England

MANCHESTER, N. H.—The Mayor and the lighting committee have recommended that a contract be made with the Manchester Tr., Lt. & Pwr. Co. for lighting lamps of the following ratings for a term of five years at the prices stated per annum: 60-cp. gas-filled tungsten lamp, $22; 100-cp. gas-filled tungsten lamp, $25; 250-cp. gas-filled tungsten lamp, $35.20, and 600-cp. gas-filled tungsten lamp, $70.

BRANDON, VT.—The Hortonia Power Company has placed an order with the Leffel Company, Springfield, Ohio, for a pair of waterwheels to be placed in the Brandon station for the purpose of driving a General Electric generator. The station will be entirely reconstructed and a transmission line will be built connecting it with the 1000-hp. hydroelectric plants now in process of construction at Hortonia. It is also intended to build a transmission line from Brandon to Gaysville, connecting with the Gaysville El. Lt. & Pwr. Co., which is also owned by the Hortonia Pwr. Co. I. M. Frost is manager of the Hortonia Co.

CLINTON, MASS.—James Tattersall recently removed his manufacturing business from Philadelphia to Clinton and is installing machinery in the building recently occupied by the Clinton Textile Co. About fourteen motor-driven machines will be used, energy being obtained from the Clinton El. Lt. Co.

PAWTUCKET, R. I.—The Rhode Island Pwr. & Transmission Co. is building a 100-ft. by 30-ft. brick and concrete power station which will have an ultimate generating rating of 30,000 kw. Three 5000-kva. transformers and a five-panel benchboard are being installed. The General El. Co. has the contract for the electrical equipment and the Connecticut River Transit Co., Worcester, is in charge of the engineering work.

Middle Atlantic

ALBANY, N. Y.—Sealed proposals will be received till 10.30 a. m. Sept. 8 for furnishing the new State Hospital for the Insane with incandescent lamps for a period of one year, delivery beginning Oct. 1, 1915. For further information address the Purchasing Committee for State Hospital, Room 138, Capitol, Albany.

BATAVIA, N. Y.—Bids will be received until Sept. 14 by Dr. F. P. Lewis, president board of managers New York State School for the Blind, for alterations and additions to the hospital building, including heating apparatus, steam piping, plumbing and electrical work. L. F. Pilcher, Albany, is State architect.

HOOSICK, N. Y.—The Walloomsac Paper Co. is installing motor-driven machinery and an electric-lighting equipment. Energy will be obtained from the transmission lines of the Connecticut River Transmission Co., and the electrical apparatus will be installed by the General El. Co.

NORTH HOOSICK, N. Y.—The Stevens Thompson Paper Mill Co. expects to install electrical equipment for operating its various machines and for illuminating the building.

CAMDEN, N. J.—The city electrical board is arranging for the installation of the necessary electrical equipment at the firehouses incidental to changing the fire department equipment to motor-driven apparatus. The work will comprise dynamo, wiring, etc.

FREEHOLD, N. J.—The Monmouth Lt. Co. expects to erect within the next two months 15 miles of 13,200-volt transmission line. W. J. Lansley is treasurer and consulting engineer.

PLAINFIELD, N. J.—District 5, Township of Piscataway, in Middlesex County, is receiving bids for furnishing street lighting for one year.

TOMS RIVER, N. J.—Bids are desired until Sept. 16 by the Board of Chosen Freeholders, James E. Otis director, for the enlargement and repair of the court house, including electrical work for the county clerk's office and the court house. Plans will be furnished by J. C. & G. A. Delatush, architects, 70 Broad Street, Red Bank, on a deposit of $5, which will be refunded if plans are returned in good condition.

WOODBRIDGE, N. J.—The street-lighting commissioners of Keasbey will receive bids up to 8 p. m. Sept. 11 for supplying and maintaining 170 25-cp. and seven 80-cp. street lamps for a term of one year. M. Everson, F. J. Fee and L. A. Black compose the board of commissioners.

SMYRNA, DEL.—Bids will be received until Sept. 29 by James A. Wetmore, acting supervising architect, Treasury Department, Washington, D. C., for the complete construction, including mechanical equipment, interior lighting fixtures and approaches, of United States post office at Smyrna. Specifications and plans may be secured at the custodian's office, Smyrna, and at office of supervising architect, Washington, D. C.

WASHINGTON, D. C.—Bids are desired until Nov. 17 by James A. Wetmore, acting supervising architect, Treasury Department, Washington, D. C., for the construction of a central heating, lighting and power plant at Washington, D. C.

WASHINGTON, D. C.—Sealed proposals will be opened at the supervising architect's office, Treasury Department, Washington, D. C., for the installation complete of an electric-elevator plant in the United States Appraisers' Stores at Boston, Mass., in accordance with the drawings and specifications, copies of which may be had at the office of James A. Wetmore, supervising architect.

WASHINGTON, D. C.—Secretary of the Navy Daniels will open bids on Sept. 29 for fifteen coast-defense submarines, the cost of which will not exceed $550,000 each. Bids, it is said, will also be received in the future for two seagoing submarines costing about $1,500,000 each. The Newport News Ship Building Company, Newport News, Va., the New York Ship Building Company, New York City, the Lake Torpedo Boat Company, Bridgeport, Conn., the Electric Boat Company, New York City, the Submarine Boat Corporation, New York City, and the Cramp Ship Company, Philadelphia, Pa., will, it is reported, submit bids. Some of these companies will go into the open market for the engines and electric machinery necessary to equip the submarines.

WASHINGTON, D. C.—Foreign trade opportunities are announced by the Bureau of Foreign and Domestic Commerce in the Commerce Reports as follows: No. 18076—A supply company in Honduras writes an American consular officer that it wishes to receive prices and descriptive catalogs of steel transmission posts for electricity. The maximum height of the post should be 30 ft. Weight should be indicated and quotations should be made f.o.b. New York or New Orleans. No. 18032—An Italian manufacturing company informs an American consular officer that it is in the market for 60,000 screw sockets per month. Contract for a year or longer will be entered into. It is stated that the company has been paying $0.006 f.o.b. port of shipment and that samples are being forwarded. When samples arrive they will be exhibited at the branch offices. No. 18083—A firm in Serbia informs an American consular officer that it desires to purchase large quantities of incandescent lamps for ordinary use. Catalogs and full information should be sent so that orders may be placed by cable. Correspondence should be in German or French. No. 18093—A buyer of telephone and electric-lamp wire in an insular possession informs an American consular officer that he desires to establish commercial relations with American exporters of galvanized iron wire 0.07874 in. in diameter for telephone lines, and non-insulated hard-copper wire for electric lamps, 0.23622 in. in diameter. He wishes to receive prices on various kinds of non-insulated copper wires and cables for electric light and power transmission. He states that he has hitherto been given 30 days' credit, but is willing to make payment against shipping documents upon arrival of goods in the foreign port. No. 18100—A firm of incandescent-lamp manufacturers in Brazil informs an American consular officer that it desires to receive catalogs, prices and full information from American manufacturers of glass bulbs of various sizes, molybdenum, straight and spiral tungsten filaments, copper, nickel and platinum wire, tin bases for electric lamps, chemicals for ground glass, anhydrous phosphorus, pure "amorpho" phosphorus, modern machinery for the manufacture of electric incandescent lamps, including vacuum pumps and rubber hose. Correspondence should be in Portuguese. Further information may be obtained upon application to the Department of Commerce, Washington, D. C., or its branches.

Maintaining Utility Service on Broadway During Subway Construction

The accompanying illustration shows two things among a multitude of others. First, it suggests reasons why the maintenance costs of an underground system in a great city are high, and second, it shows the tremendous odds against which an operating company works in maintaining the continuity of its service. Here the busiest section of Broadway, at Forty-second Street, in New York City, is shown disemboweled on account of the construction work on the new subway.

High-tension 15,000-volt cables are exposed on the right, the 600-volt third rail is exposed in the center, and the Edison low-tension cables are mixed up in a miscellaneous way with telephone, fire-alarm, stock-quotation and Western Union cables. Yet all of these services have not suffered an interruption such that users have been inconvenienced in any way.

One of three new concrete and tile duct lines for the cables shown can be seen at the left of the surface-line tracks, with another similar set at the right of these tracks to contain the high-tension cables leading from the Kingsbridge station of the New York Edison Company to the Waterside station, as well as other feeders for the New York Railways Company. The Edison low-tension cables shown at the left of the photograph and the telephone and other low-potential cables will be placed in another duct line constructed under the sidewalk and connected to manholes.

North Central

DETROIT, MICH.—The George A. Fuller Co., general contractor, is receiving bids for a number of motors which will be used in the new Penobscot Building addition.

KALAMAZOO, MICH.—A tentative report of the survey of the local municipal lighting plant has been tendered by F. W. Ballard, chief engineer of the Cleveland (Ohio) municipal electric-light plant. Mr. Ballard in his report recommends that a bond issue of $350,000 be made to cover the cost of extensions which it is desirable to make in the present lighting plant to meet the demands of the consumers.

BELLEFONTAINE, OHIO.—The City Council is considering a plan presented by F. Shipley for the installation of 49 one-lamp ornamental iron posts. Underground construction is recommended, and an extra swtichboard will be required at the local lighting plant.

CINCINNATI, OHIO.—Bids will be received until Sept. 24 at United States engineer's office, Cincinnati, Ohio, for furnishing and installing operating machinery, etc., at Dam No. 29, Ohio River.

CINCINNATI, OHIO.—The court house building commission has let to the Standard Engineering Co. the contract for the mechanical equipment of the new court house, including a complete lighting plant and a large amount of other electrical work, at $203,855. S. Franklin Gardner is temporarily in charge of the work for the company.

CINCINNATI, OHIO.—C. W. Handman, business manager of the Board of Education, City Hall, is receiving bids for the electrical and other work involved in several school buildings, as follows: Until Sept. 13, remodeling Washburn School; until Sept. 13, remodeling Lincoln Public School; until Sept. 13, manual training building at Oyler Public School. Complete plans and specifications can be had of Mr. Handman.

CINCINNATI, OHIO.—Sealed proposals will be received at the office of the Board of Education, City Hall, Cincinnati, until 12 o'clock noon, Monday, Sept. 20, for furnishing all materials and doing all work which is necessary in connection with the construction, including electrical and elevator equipment of the bridge, tower and buildings A, B, C, D and E of the new East Side High School, at the corner of Madison Road and Erie Avenue, Hyde Park. Blank forms and other information may be obtained from C. W. Handman, business manager, Board of Education, City Hall.

CLEVELAND, OHIO.—Sealed proposals will be received by the commissioner of purchases and supplies, City Hall, Cleveland, until 12 o'clock noon Sept. 8, for purchasing and installing lighting fixtures in the City Hall building. Each bid must be made in accordance with the drawings and specifications which may be obtained at the office of the architect, J. M. Byer, Cleveland, upon the deposit of $15, $8 of which will be refunded upon the return of the drawings and specifications in good condition. All proposals must be made on special forms.

CLEVELAND, OHIO.—The Cleveland El. Il. Co. is negotiating with Lakewood, a suburb of Cleveland with a population of about 18,000, for a renewal of its contract for street lighting. The contract expires in April, 1917.

MIDDLETOWN, OHIO.—S. C. Pollard, Cincinnati, is engineer for the proposed $120,000 water-works recently voted for by the people.

SPRINGFIELD, OHIO.—Property owners are being served with the legal notices necessary to put through the proposed cluster lighting system for the down-town streets, which will be partly paid for by the owners of the abutting property. It is hoped to complete the legal requirements and get the contracts let in time for the work to be completed this fall.

CLAY, KY.—Within the next six months the Perry Lt. & Ice Co. expects to purchase one belted second-hand 60-cycle, 2200-volt, single-phase, 50-kw. to 75-kw. alternator with exciter, type W. A. L. Fort Wayne being preferred. A second-hand 50-hp. to 100-hp. steam engine will also be purchased. The company is also building a 3-mile high-tension transmission line. C. R. Clark is secretary.

HENDERSON, KY.—The city purposes to add a new boiler house to the municipal lighting plant, replacing the temporary structure put up after a storm some months ago. Reports that the plant was to be sold to a private company have been discredited by Mayor Johnson.

IRVINE, KY.—The Irvine Lt. Co. expects to begin operation about Sept. 1.

JUNCTION CITY, KY.—The city trustees have ordered the sale of an electric light, power and traction franchise.

LANCASTER, KY.—Two generators, one of 60 kw. and the other of 120 kw., besides an electrical pump, are included in the improvement projected by the city in the way of an electric-light plant and a water system.

LOUISVILLE, KY.—A 350,000-bushel grain elevator, to be electrically operated, is projected by W. A. Thomson, a Louisville grain dealer, who, it is stated, will probably give the contract to the Burrell Engineering Co. of Chicago. The cost is estimated at $70,000.

PADUCAH, KY.—The City Commission has made an appropriation to provide for a new arc machine, ten arc lamps, an oil reservoir and coal-handling chutes.

WARSAW, KY.—The plant of the Warsaw El. Lt. & Ice Co. is practically completed, and it is expected to begin service about Sept. 1.

CRAWFORDSVILLE, IND. — About March 1 the Crawfordsville El. Lt. & Pwr. plant expects to purchase one 1500-kw. turbo-generator with condenser, pump, switchboard equipment and steam header. S. H. Miller is superintendent.

GAS CITY, IND.—Within the next two months the municipal electric light and water plant expects to purchase one boiler-feed pump, and within the next three months one carload of poles. T. S. McKee is superintendent.

SHOALS, IND.—The Booster Club and the town officials have planned to contract with the National Constr. Co. for the erection of a water and lighting plant. It is intended to have the plant in operation by the end of the year.

BELLEVILLE, ILL.—The lowest bid received by the Board of Education for the electric wiring, fixtures, clocks, bells and telephones for the new high school was from the A. E. Kramer El. Co. of this city. The company's bid was $6,487. The contract is yet to be let.

EAST ST. LOUIS, ILL.—The Rapid Transit Co. has been incorporated with a capital of $100,000 to construct an electric railway from East St. Louis to Mount Carmel by way of St. Clair, Monroe, Randolph, Jackson, Williamson, Saline, Hamilton, White, Edwards and Wabash County, with special branch lines to Chester and Murphysboro. The incorporators are J. Vonnhame and M. Harned, East St. Louis, and L. P. Hooltman, Collinsville.

ELIZABETH, ILL.—The Elizabeth Lt. & Pwr. Co. will accept bids on the installation of a three-mile transmission line, substation and distribution system in the town of Elizabeth up to 2.30 p. m. Sept. 13. Specifications may be had by addressing Dr. A. J. Nichols, Elizabeth, Ill. A deposit of $5 is required.

MACOMB, ILL.—The contract for lighting fixtures for the new Macomb high school has been awarded to O. P. Haptonstahl of this city on his bid of $573.

RANKIN, ILL.—Within the next two months the El. Lt. Co. expects to install one 80-hp. boiler, one 100-hp. engine and one 75-kva., 2200-volt electric generator with switchboard. Charles J. Crump is owner and manager.

TOULON, ILL.—Within the next three years the Toulon Lt. & Pwr. Co. expects to purchase a direct-current 110-volt switchboard. Electrical appliances and supplies will also be purchased in limited quantities. M. C. Fuller is manager.

WAUKEGAN, ILL.—The Chicago & Milwaukee El. R. R. has applied to the Council for a franchise. G. S. Henry, Highwood, is superintendent.

LODI, WIS.—The present direct-current 220-volt distribution system will be rebuilt and connected with the three-phase, four-wire, 2300-volt distribution system now being constructed in connection with the substation at Dane. Induction regulators will be installed at Dane for obtaining good voltage regulation. Vaughn, Meyer & Sweet, Milwaukee, Wis., are the engineers.

CORRECTIONVILLE, IOWA.—The Correctionville Lt. & Pwr. Co. expects to install within two months forty electroliers.

HUNTER, N. D.—The Hunter Lt. & Pwr. Co. expects to purchase within the next twelve months an engine-driven generating unit, pumping equipment, switchboard, conduit, meters and various equipment for its street-lighting system. Within the next two months the company expects to purchase ten washing machines, two dozen heating and cooking devices, and a number of wiring supplies. R. D. Hockridge is secretary and general manager.

TEKAMAH, NEB.—Within the next two months the municipal electric-light plant expects to erect a new power house and within the next ten days to purchase one 150-hp. Corliss-type steam engine, two boilers, one 100-kva. generator and a switchboard. F. A. Nassum is Mayor.

HUTCHINSON, KAN. — The United Water, Gas & El. Co. expects to install five additional blocks of ornamental lighting system and to build 2½ miles of 500,000-circ. mil direct-current transmission line.

Southern States

LUMBERTON, N. C.—It is reported that improvements are contemplated to the municipal electric-light plant and water-works to cost about $25,000. G. C. White, Charlotte, is engineer.

RALEIGH, N. C.—A "white way" is to be installed and opened on Oct. 18. J. E. Pogue is chairman of the "Great White Way" committee.

GAINESVILLE, FLA.—The Municipal Wtr., Lt. & Pwr. Co. expects to purchase within the next twelve months one 220-hp. water-tube boiler. T. M. Early, P. O. Box 506, is superintendent.

HENDERSON, TENN.—The city has voted bonds, recently noted as proposed, for constructing an electric-light plant, water-works and sewers. J. I. Galbraith is Mayor.

NEWPORT, TENN.—It is reported that the town will shortly place on the market an issue of electric-light bonds to the amount of $23,000.

McNEIL, ARK.—Electric service has been installed in this town, energy being obtained from the Arkansas Lt. & Pwr. Co. Telephone service has also been furnished.

NATCHITOCHES, LA.—Within the next twelve months the municipal electric-light and water-works plant expects to erect a new brick power house, and within the next four months to purchase one feeder panel for a 100-kw. generating unit. Within the next six months the plant expects to erect a distribution line to East Natchitoches which will require about 5000 ft. of wire and about four 2½-kw. transformers. Walter E. Aymond is superintendent.

WHITE CASTLE, LA.—The citizens of this town have voted $25,000 in bonds to be issued for constructing water-works and electric-light plant from plans of S. V. Kramer, Magnolia, Miss.

AUSTIN, TEX.—A bond issue of $40,000 was registered in the controller's office for the building of an electric-light plant.

DENISON, TEX.—The Texas Pwr. & Lt. Co. has purchased a site on the Red River for a new $750,000 plant to be completed by Jan. 1, 1917.

Pacific States

TACOMA, WASH.—The Tacoma Central Htg. Co., as the result of the action of the City Council in authorizing a reduction of electric-lighting rates to 1.5 cents per kilowatt-hour for office buildings of 200,000 cu. ft. or more, announces that it is ready to begin the construction of a central heating plant and the installation of lines to business buildings, the project to entail the expenditure of between $200,000 and $250,000.

BAKER CITY, ORE.—The city has decided to improve the municipal light plant, and 1200 ft. of the penstock at the power plant will be changed from 8-in. to 24-in. pipe, to lessen friction. About 2500 ft. of the penstock will not be changed. When this improvement is made, City Engineer L. R. Stockman asserts the output of the generator in the city plant will be greatly increased. The cost of the improvements to the penstock is estimated at about $7,500. About 766 20-watt, 15-cp. lamps will be installed on Main and First Streets, from Auburn to Church Street, at a cost of about $2,000.

ROSEBURG, ORE.—A petition asking the City Council to issue $250,000 in bonds for the construction of water-works and electric-light systems is being circulated. The petition asks that immediate steps be taken to secure a water right to North Umpqua River.

PEACH SPRINGS, ARIZ.—The United States Department of the Interior has granted permission to Col. Epes Randolph of Tucson and associates to make preliminary surveys of the proposed dams that they plan to build across the Colorado River in the Grand Canyon, near Peach Springs, and the construction of a series of hydro-electric plants. J. B. Girard, city engineer of Phoenix, is one of the promoters of the project.

MALTA, MONT.—The Malta Lt. Co. expects to install 1700 ft. of 2300-volt underground cable within the next month. A small amount of material will also be purchased in connection with its distribution and lighting system. A. P. Le Vesconte is treasurer and manager.

Canada

HAMILTON, ONT.—It is reported that engineers of the Hydro-Electric Power Commission, Toronto, are surveying for an electric line from Hamilton to cross Dover and other points on Lake Erie and for a railway to St. Catharines and all intermediate points, including a branch line to Dunnville and Cayuga.

PETROLEA, ONT.—The City Council has authorized the Reeve to sign a contract with the Hydro-Electric Commission of Ontario, Canada, for the purpose of constructing a hydroelectric system.

TORONTO, ONT.—An application of the Toronto Hydro-Electric Board for the passage of a by-law by the City Council providing for the raising of $1,375,000, for extensions and improvements to the system, has been approved by City Treasurer Patterson and City Auditor Sterling.

Miscellaneous

PANAMA.—Bids will be received until Sept. 16 by Major F. C. Boggs, U. S. A., general purchasing officer the Panama Canal, Washington, D. C., for furnishing electric cable according to Circular 964.

PANAMA.—Bids will be received until Sept. 13 by Major F. C. Boggs, U. S. A., general purchasing officer the Panama Canal, Washington, D. C., for furnishing according to Circular 962 by steamer, free of all charges, on dock at either Colon, Cristobal or port of Ancon, Balboa, Isthmus of Panama, switchboards, cables, etc., for Dry Dock No. 1, Balboa Terminals.

Directory of Electrical Associations

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 8 West 40th St., New York. Annual convention, San Francisco, Oct. 4-8.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. Meeting, San Francisco, Sept. 16-18.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, Eugene W. Stern, 101 Park Ave., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country. Panama-Pacific convention, San Francisco, Sept. 16-18.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. Secretary, William H. Ross, 154 Nassau St., New York City.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary-treasurer, Roy B. Fowles, Pine Bluff, Ark.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General secretary, C. E. Dustin, 62 Cedar St., New York.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, George C. Holberton, San Francisco, Cal. Annual convention, Spring Lake, N. J., Sept. 13-16.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, W. T. Snyder, McKeesport, Pa. Annual meeting, Hotel Statler, Detroit, Sept. 8-11.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. S. Hanbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, Alan Sullivan, 10 Adelaide Street East, Toronto, Can.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col. Annual convention, Glenwood Springs, Sept. 23-25.

COMMERCIAL SECTION, N. E. L. A. Secretary, C. A. Littlefield, 130 East 15th St., New York.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, Lee Hapgood, General Electric Co., Schenectady, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF ILLINOIS. Secretary, H. E. Chubbock, Peoria, Ill.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary A. J Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE STATE OF PENNSYLVANIA. Secretary, M. G. Sellers, 1518 Sansom St., Philadelphia.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, A. D. Page, 30 Church St., New York.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Quarterly meeting Niagara Falls, Ont., Sept. 14-16.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Executive secretary, A. Jackson Marshall, 29 West 39th St., New York. Sections in the principal electrical centers throughout the country. Annual convention, Cleveland, Oct. 18-19.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York. Annual meeting, New York City, Oct. 7 and 8.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Wier, Athens, Ga.

ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. J. Burns, Moline, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, C. A. Littlefield, 29 West 39th St., New York. Annual convention, New Willard Hotel, Washington, D. C., Sept. 20-23.

INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA. Secretary, W. S. Vivian, 19 South LaSalle St., Chicago.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind. Annual convention, Terre Haute, Sept. 8-10.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skilman, Indianapolis, Ind.

INDUSTRIAL ELECTRIC HEATING ASSOCIATION. Secretary, Homer Kunz, Toledo Railways & Light Co., Toledo, Ohio.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, David Sarnoff, 71 Broadway, New York. Annual meeting, San Francisco, Sept. 13-18.

INTERNAL COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 West Indiana St., Chicago.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ENGINEERING CONGRESS. Secretary-treasurer, W. A. Cattell, Foxcroft Building, San Francisco, Cal. Congress, San Francisco, Sept. 20-25.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

IOWA SECTION, N. E. L. A. Secretary, W. H. Thompson, Des Moines, Ia.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Ia.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia.

JOVIAN ORDER. Jupiter (president), Homer E. Niesz, Chicago, Ill.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo. Annual meeting, Chicago, Oct. 13-15.

KANSAS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Mercer, 108 West 8th Ave., Topeka, Kan.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St. Meeting every Wednesday, Audubon Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MICHIGAN SECTION, N. E. L. A. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, G. M. Jones, 14 Seventh St. N., Minneapolis, Minn.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the National Electric Light Association. Secretary-treasurer, H. F. Wheeler, Hattiesburg, Miss. Convention, Hattiesburg, Nov. 10 and 11.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS Secretary-treasurer, William L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y. Annual meeting, New York, October, 1916.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederick P. Vose, 1343 Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Permanent headquarters, Room 204, Hotel LaSalle, Chicago, Ill.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, S. J. Bell, David City, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass. Annual convention, Mount Kineo House, Kineo, Maine, Sept. 14-17.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell, N. M. Meeting, Aubuquerque, Feb. 14-16, 1916.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 365 East 21st St., Brooklyn, N. Y.

NORTHWEST SECTION, N. E. L. A. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash. Annual meeting, Portland, Ore., Sept. 8-11.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary-treasurer, J. W. Oberender, 502 Dekum Bldg., Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, H. N. Müller, 435 Sixth Ave., Pittsburgh, Pa. Annual meeting, Bedford Springs, Pa., Sept. 8-10.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davis, West Virginia Water & Electric Co.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, George H. Wygant, Tampa, Fla. Annual meeting, Asheville, N. C., Sept. 22-24.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

TRI-STATE WATER & LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt. Midsummer meeting, Rutland, Vt., Sept. 9 and 10.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 Jackson Blvd., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED AUG. 24, 1915.

[Prepared by Mitchell & Allyn, 41 Park Row, New York.]

1,150,872. SIGNALING MECHANISM FOR AUTOMOBILES; S. W. Meredith and T. Walsh, Philadelphia, Pa. App. filed Aug. 19, 1914. Pair of semaphores at opposite sides of rear of automobile.

1,150,895. CONDENSER; A. K. Sloan, Brooklyn, N. Y. App. filed Aug. 7, 1912. Adjustable capacity for radio-transmission.

1,150,907. LIGHTNING-ROD TERMINAL; G. E. Thompson, Owatonna, Minn. App. filed Jan. 19, 1912. Keeps soil moist around the terminal.

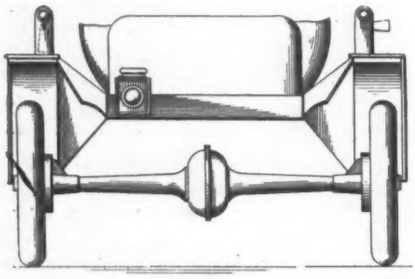
1,150,917. STORAGE BATTERY; T. A. Willard, Cleveland, Ohio. App. filed April 29, 1915. Terminals automatically sealed in position.

1,150,918. CONNECTOR FOR STORAGE BATTERIES; T. A. Willard, Cleveland, Ohio. App. filed April 29, 1915. Terminals automatically sealed against creepage of battery solution.

1,150,926. PROTECTIVE APPARATUS FOR ELECTRIC CIRCUITS; W. E. Britton, Muskegon, Mich. App. filed March 12, 1915. Lightning arrester.

1,150,935. ELECTRIC WIRING FITTING; S. R. Fralick, Chicago, Ill. App. filed March 21, 1912. For connecting armored cables to outlet boxes.

1,150,939. ELECTRIC-HEATING SYSTEM; L. P. Hynes, Chicago, Ill. App. filed Jan. 12, 1914. For electric cars.



1,150,872—Signaling Mechanism of Automobiles

1,150,945. FIRE-ALARM GUARD; S. Jarozs, Detroit, Mich. App. filed April 17, 1915. Handcuff grips operator of alarm.

1,150,953. SELENIUM-CELL REGULATOR; M. Moskowitz, New York, N. Y. App. filed June 29, 1910. Improved means for controlling the light which falls on the selenium cell.

1,150,968. ELECTRIC SADIRON; H. Rosenthal, Camden, N. J. App. filed Dec. 18, 1912. Currents of air transfer heat to various parts of the iron.

1,150,973. AUTOMATIC CURRENT CUT-OFF FOR ELECTRICAL APPLIANCES; U. S. Smith, Sacramento, Cal. App. filed Nov. 14, 1914. Member fuses to permit spring disconnection of plug.

1,151,003. CATALYTIC MATERIAL AND PROCESS OF MAKING SAME; Carleton Ellis, Montclair, N. J. App. filed May 4, 1915. Electric nickel in highly extended form.

1,151,011. PEDESTAL; W. Hegenscheidt, Chicago, Ill. App. filed Oct. 12, 1914. Made of plastic material with the metal parts molded therein.

1,151,025. RAILWAY TRAIN-CONTROLLING SYSTEM; J. C. McDonald, New York, N. Y. App. filed Oct. 9, 1911. Power cut off from motor seeking to enter occupied block.

1,151,026. RAILWAY TRAIN-CONTROLLING SYSTEM; J. C. McDonald, New York, N. Y. App. filed Dec. 10, 1912. Employs sectional third-rail.

1,151,027. RAILWAY TRAIN-CONTROLLING SYSTEM; J. C. McDonald, New York, N. Y. App. filed June 26, 1913. Contact shoes on train engage sectional rail.

1,151,038. ATTACHMENT PLUG; C. D. Platt, Bridgeport, Conn. App. filed March 9, 1915. Has current tap on side.

1,151,077. STORAGE BATTERY; T. A. Willard, Cleveland, Ohio. App. filed April 29, 1915. Automatically prevents overfilling of battery cell.

1,151,098. RADIOTELEGRAPHIC PLANT; E. Girardeau, Paris, France. App. filed Dec. 1, 1911. New receiver with plurality of "induction jiggers."

1,151,114. FLASHLIGHT; G. Matthies and A. Rehberg, Jr., San Antonio, Tex. App. filed April 30, 1915. Installed in handle of cane.

1,151,118. APPARATUS FOR CHECKING ELECTRO-CARDIOGRAPHS, OSCILLOGRAPHS AND THE LIKE; G. Mylo, Charlottenburg, Germany. App. filed April 8, 1913. Embodies a reflecting galvanometer.

1,151,129. ELECTRICAL GAS LAMP AND METHOD OF PRODUCING LIGHT BY MEANS OF THE SAME; F. Skaupy, Berlin, Germany. App. filed March 12, 1913. Uses rare gases and obtains phenomena of arc-light character.

1,151,135. FUSE CARTRIDGE; E. Stransky, New York, N. Y. App. filed Nov. 21, 1914. Multiple-fuse construction.

1,151,162. ELECTRIC SWITCH; C. Carson, New Rochelle, N. Y. App. filed March 29, 1915. For flashlamp using ordinary dry cell.

1,151,179. INSULATOR; E. D. Harris, Sycamore, Ill. App. filed April 25, 1914. Requires no tie wires.

1,151,185. ELECTRICAL APPARATUS; F. C. Jamison, Cleveland, Ohio. App. filed Aug. 17, 1914. For preventing the freezing of expanding nitrous-oxide gas.

1,151,189. ELECTRICALLY HEATED COOKER; A. J. Kercher, Berkeley, Cal. App. filed Dec. 14, 1912. "Fireless" principle; heat transferred through medium of steam.

1,151,201. FLASHLIGHT; L. B. Lincoln, Chicago, Ill. App. filed April 26, 1915. In simulation of pen or pencil.

1,151,214. COMBINED ATTACHMENT PLUG AND BASE; M. Norden, New York, N. Y. App. filed Nov. 7, 1913. For connecting a branch at any desired place in an electric main.

1,151,216. SELECTIVE ELECTRICAL SIGNALING APPARATUS; L. M. Potts, Baltimore, Md. App. filed Nov. 18, 1911. Time intervals allotted individual signals are divided into equal impulse periods. (Fifty-one claims.)

1,151,241. MAGNETIC SHORT-CIRCUITING SWITCH; L. and H. L. Bradley, Milwaukee, Wis. App. filed July 18, 1913. Compressible-resistance motor starter.

1,151,264. AUTOMOBILE ALARM; R. C. Groh, St. Paul, Minn. App. filed Oct. 3, 1912. Thief alarm.

1,151,345. VAPOR-ELECTRIC DEVICE; W. W. Crawford, Lynn, Mass. App. filed April 12, 1913. High-pressure vapor lamp.

1,151,403. ELECTRIC HEATER; E. P. Ryce and W. Wallace, Louisiana, Mo. App. filed Dec. 12, 1914. Submersible water heater.

1,151,453. ELECTRIC STORAGE BATTERY; B. Ford, Philadelphia, and J. L. Phillips, Haverford, Pa. App. filed Nov. 22, 1909. Prevents acid creeping over top of battery.

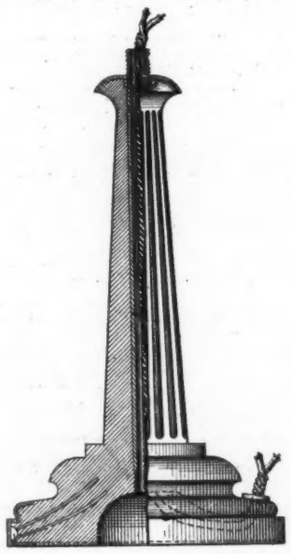
1,151,497. MOUNTING FOR RELAYS OR THE LIKE; E. A. Reinke, Rochester, N. Y. App. filed May 10, 1915. Improved mounting renders telephone relays readily accessible.

1,151,530. MOTORCYCLE LIGHTING SYSTEM; A. H. Neuland, Bergenfield, N. J. App. filed Jan. 19, 1914. Improved magneto construction.

1,151,541. CALLING DEVICE FOR AUTOMATIC TELEPHONE EXCHANGES; A. E. Keith, Hinsdale, and J. and C. J. Erickson, Chicago, Ill. App. filed May 4, 1903. Talking and ringing circuits separated when receiver hook descends. (Sixty-one claims.)

1,151,542. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; A. E. Keith and T. G. Martin, Chicago, Ill. App. filed Dec. 20, 1906. Party-line exchange. (Sixty-four claims.)

1,151,543. TELEPHONE-EXCHANGE TRUNKING SYSTEM; A. E. Keith, Chicago, Ill. App. filed Aug. 28, 1908. Of economical manufacture and installation.



1,151,011—Pedestal

1,151,544. NON-INTERFERING EXTENSION PARTY-LINE TELEPHONE SYSTEM; T. G. Martin, Chicago, Ill. App. filed Nov. 25, 1905. Improved lock-out device. (112 claims.)

1,151,545. LOCK-OUT FOR EXTENSION OR PARTY-LINE TELEPHONES; T. J. Martin and J. Erickson, Chicago, Ill. App. filed Dec. 18, 1905. Magneto controllable by subscriber for opening normally closed switches in the lines. (132 claims.)

1,151,546. AUTOMATIC COMMON-BATTERY PARTY-LINE TELEPHONE SYSTEM; T. G. Martin, Chicago, Ill. App. filed Feb. 3, 1906. Improved and highly efficient system. (162 claims.)

1,151,547. AUTOMATIC EXTENSION TELEPHONE SYSTEM; T. G. Martin and F. Lubberger, Chicago, Ill. App. filed Dec. 20, 1906. Improved lock-out arrangement for the extension lines. (Fifty-eight claims.)

1,151,550. MOTOR STARTER; G. H. Whittingham, Bancroft Park, Md. App. filed Jan. 20, 1911. Magnetic operation with special provision to prevent premature operation.